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Sound Cost Methods Reduce Waste

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No business today can afford to tolerate conditions that drain its resources without productive return. A sound system of costing provides an effective means of uncovering and eliminating these leaks

UNDER "Simplified Profit Reports" (*AM*—Vol. 76, page 257), it was said that "the objective of business is profit," and for the purpose of profit control, this article segregated the various elements entering into the profit and loss into three classes, representing the sources of these profits and losses: (1) standard (normal), (2) operating, (3) non-operating. Under the operating class was placed: (a) material variances, (b) labor variances, (c) burden variances. These variances are the variations between expenditures actually made and what the same activities should cost with the plant running at normal. The cause of most variances is waste, and it is the purpose of this article to show how good costing methods will reduce waste, thus making profits by widening the gap between selling price and cost.

So that we may think in the same channel, let us first establish a few fundamentals:

1. Every machine builder sells both the mental and physical effort required to transform raw materials into finished products suitable to the needs of his customer.
2. Many operations are necessary to bring about this transformation, each one subject to its own contribution to losses of profit caused by wasted materials, capital investment and labor.
3. One important function of a cost system is to measure these wastes.
4. All machinery builders have these wastes, but all do not have cost methods that will assist management in reducing them.

Waste may be classified as: (1) capital investment, (2) materials, (3) labor. Capital investments include: (a) land, (b) buildings, (c) equipment. Materials include: (a) direct, (b) supplies and small tools, (c) repairs. Labor includes: (a) engineering, (b) production, (c) selling, (d) supervision, (e) indirect.

In order that labor operations may be performed, investments must be made in land, buildings and equipment, to furnish: (1) a place for the man to work, (2) tools for him to work with.

These facilities are provided for sufficient men, working a normal number of hours, to meet the anticipated volume of sales. Failure to perform the labor operations or to market the product up to the established standard will result in wasted capital expenses, such as: (1) depreciation, (2) taxes, (3) insurance, (4) interest on investment.

These costs, except those portions of depreciation caused by the wear and tear of production, continue through boom, normal and depression periods. In pe-

riods of low production, like the present, these wasted capital costs cannot be controlled directly. The wise executive recognizes that these periods are sure to follow periods of normal and overproduction and establishes his sales policy on costs that will absorb these capital expenses over a period of years. In this way, he collects from the customers of normal and boom periods a sufficient extra surplus to compensate him for the waste occuring in periods of low production.

Any system of accounting recognizes the presence of taxes and insurance. But there are still a few machinery builders who do not recognize the element of obsolescence in depreciation, and charge depreciation to their costs with an amount in direct ratio to labor operation costs. The obsolescence element in depreciation is now, and will be in the future, a larger increment than the replacement cost caused by worn out and broken machinery.

There is an old saying "A penny saved is a penny earned." If we acknowledge that, then we must accept the converse that, "A penny not saved is a penny wasted." Let us apply this philosophy to the inclusion of interest on investment in costs. Admitting that interest on investment is "the wages of capital," then there will be nothing left to pay capital its wages, if during periods of low production, all the income from sales is used to pay for materials, labor and current expenses. Capital might have been placed elsewhere and received wages. This waste of capital wages can be reduced by including interest on investment in normal burden rates, thus collecting enough wages in periods of boom and normal production to offset lost wages on the capital invested in periods of low production.

There is a tremendous waste of capital investment during boom and normal periods that is caused by inefficient operators. For example, take a 48x48 in. x 12 ft. planer with an investment of $18,000 in the machine and permanent fixtures, and occupying 450 sq.ft. of floor space:

OPERATION COST

Building Expense	$376
Equipment Taxes, Insurance and Interest	1,253
Repairs	609
Power	1,186
General Expense	1,457
Depreciation	1,780
Total Burden	6,661
Capacity—50 weeks at 48 hours each equals	2,400 hours
Normal Utilization—60% of capacity equals	1,440 hours
Burden Rate—$6,661 ÷ 1,440 hours equals	$4.63 per hour

The following illustrations show the measurement of waste, a large portion made up of capital expenses, caused by the operator's taking too much time on the job:

	Hours	Labor	Burden	Total
Straight day work				
Allowed time	10	$7.00	$46.30	$53.30
Actual performance	15	10.50	69.45	79.95
Waste	5	3.50	23.15	26.65
Premium and bonus				
Allowed time	10	7.00	46.30	53.30
Actual performance	15	5.55	69.45	75.00
Waste	5	1.45	23.15	21.70
Piece work				
Basic time	10	7.00	46.30	53.30
Actual performance	15	7.00	69.45	76.45
Waste	5	0	23.15	23.15

RESERVED STOCK RECORD

ORDERED Date	Order No	Quantity	BALANCE	RESERVED Quantity	Order No	Date
1937 7-1	Inventory		80			
			55	25	1164	1-10
			5	50	1485	2-24
2-25	34675	100 R	105			
			104	1	56875	3-11
			102	2	1485	3-16
			52	50	1670	3-18
			2	2	1486	4-20
5-21	35842	100 R	102			
6-15	35842	2	104			

Max 100 Min 50 SYMBOL C-3467 Description East Column

Fig. 1—Material may be controlled by accurate records of the amount on order and that actually assigned to current orders. Material received is designated by the letter *R*

JOB TIME CARD

EMPLOYEE - No _____ Name _____

Order NO _____ Symbol No _____

Description _____

Operation _____

Pieces on Order _____ Start _____ Finish _____

PRODUCTION		CALCULATION					
			LABOR			BURDEN	
			Standard	Actual	Premium	Standard	Actual
Oper							
Set Up		Rates	.50	.60	.30	2.00	2.84
		PROD Rate	.5			Department	
Good Pieces 6		PROD Pieces	6			8	8
Defective Pieces 0		PROD Hours	3.0	4.5	1.5	Machine	
Operating Time 4.5		Set Up	1.5	1.3	.2	110	112
Oper. Time Each .7		Total Hrs	4.5	5.8	1.3		
Set Up Time 1.3		COST	2.25	3.48	.39	9.00	15.47

Fig. 2—A daily comparison between actual and standard costs may be made by means of a card which shows both labor and burden items

In the second illustration "premium and bonus" operators are allowed one half the saved time, based upon their wage rate per hour, and are penalized an equal amount for lost time.

The above illustrations show most convincingly that the actual wages paid have no bearing on the burden loss or wasted capital expenses. However, because the planer was operated 50 per cent over the established time for the job, it used up $23.50 worth of burden, which if the operator had come within the time limit, would have been saved and the profits on the job increased by a like amount.

Some manufacturers will argue that so long as the time is kept down to the minimum the burden will take care of itself. That is true, but I am sure that all will agree that it is helpful to management to know where these losses occur. Other manufacturers will say, "I don't have any big planers in my plant so this opportunity of saving wasted capital expenses means nothing to me." Admitted there is not as much opportunity to reduce waste in plants operating smaller and cheaper equipment,

JOB TIME CARD

PRODUCTION		CALCULATION						
			LABOR			BURDEN	
			Standard	Actual	Premium	Standard	Actual
Oper / Set Up		Rates	.50	.50	.25	2.00	2.00
		PROD Rate	.5				
Good Pieces 16		PROD Pieces	16			8	8
Defective Pieces		PROD Hours					
Operating Time 8		Set Up				110	110
Oper. Time Each 4		Total Hrs	8.0	8.0			
Set Up Time		COST	4.00	4.00		16.00	16.00

Fig. 3—Switched to another machine, the job recorded in Fig. 2 makes a better showing

JOB TIME CARD

PRODUCTION		CALCULATION						
			LABOR			BURDEN	
			Standard	Actual	Premium	Standard	Actual
Oper / Set Up		Rates	.50	.50	.25	2.00	2.00
		PROD Rate	.5				
Good Pieces 20		PROD Pieces	20			8	8
Defective Pieces		PROD Hours					
Operating Time 8		Set Up				110	110
Oper. Time Each 4		Total Hrs	10.0	8.0	2.0		
Set Up Time		COST	5.00	4.00	.50	20.00	16.00

Fig. 4—The results of the third day's operation on a lot of 100 pieces is shown above. With the changeover time taken care of during the second day's operation, the full benefit of the proper machine is realized

but I think the following example will convince this skeptical manufacturer that the opportunity of saving is great enough to be given careful consideration. This example is based upon a 16-in. engine lathe with an investment of $2,000 in the machine, and occupying 90 sq.ft. of floor space.

OPERATING COST

Building Expense	$75
Equipment Taxes, Insurance and Interest	137
Repairs	70
Power	237
General Expense	844
Depreciation	244
Total	1,607
Normal Hours	1,440

Burden Rate—$1,607 ÷ 1,440 hours equals $1.12 per hour

	Hours	Labor	Burden	Total
Allowed Time	10	$7.00	$11.20	$18.20
Actual Performance	15	10.50	16.80	27.30
Waste	5	3.50	5.60	9.10

Wasted capital expenses may be reduced by:

1. The introduction of effective wage incentive systems, thus securing more salable product with the same fixed expense.
2. Weeding out obsolete and worn out equipment.
3. Scheduling operations to the most economical machines.
4. Keeping the equipment in the best possible condition.
5. Providing adequate floor space around the machine for handling the materials easily and quickly. Floor space is cheaper than operating wages of the man and the burden of the machine.
6. Seeing that the operator is experienced and has a natural adaptness for the operation intrusted to him.
7. Providing facilities and men to handle materials so that the operator may keep the machine busy.

Good costing methods will aid management in reducing these wastes by:

(a) Establishing normal costs per hour to operate each department, and for each machine in such departments as the conditions indicate the use of machine rates. Without these departmental and machine standards, a true cost of wasted effort cannot be had.

(b) Reporting wasted burden for each day's operations immediately after performance, so that management may be in a position to take corrective measures on incompleted jobs.

Wastes of materials are usually caused by:

1. Paying too much for the materials, because:
   (a) The buyer does not keep in touch with the market.
   (b) Of faulty stock records that do not furnish the buyer with information concerning the needs of the shop soon enough to allow him to buy at the lowest price obtainable.
2. Faulty specifications, causing:
   (a) Expense of reordering materials,
   (b) Cost to put accepted defective materials in usable condition,
   (c) Extra cost of machining and assembling because materials were the wrong size or grade,
   (d) Rejection of finished product because materials were not right,
   (e) Delayed production pending receipt of reordered materials.
3. Production:
   (a) Wrong instructions from the engineering department,
   (b) Wrong instructions from supervising foremen,
   (c) Defective stock,
   (d) Inexperience or carelessness of the operator,
   (e) Faulty equipment,
   (f) Poor working conditions.
4. Overbuying:
   (a) Market price reductions after stock was purchased,
   (b) Deterioration of materials,
   (c) Obsolescence,
   (d) Housing cost,
   (e) Interest on investment.

The profit advantages of measuring and controlling wasted labor are most generally accepted in industry. Manufacturers have realized for some time that some sort of labor standards must be set for the separate jobs, so that they may measure the efficiency of the individuals to whom the jobs are assigned.

Regardless of the method of establishing standard

or allowed times on individual operations, the placing of this information in the hands of the operator has a decided stimulating effect on the personnel of the department. Anything that will influence operators to reduce the working time on a job contributes to the elimination of wasted capital expenses, direct labor and many current expenses. In setting standards, time studies are generally more reliable than records of previous operations as these may include unmeasured inefficiencies.

It is not sufficient to know only the quantities of materials actually on hand. The management must know also how much of that material will be used on orders already booked, even though it has not yet been delivered to the shop for production.

The form shown in Fig. 1 has been used with marked success to reduce waste in purchasing activities. The record starts with the actual inventory at a specified date, thereafter adding all materials purchased, and deducting all materials reserved for shop orders. Entries are made at the time of issuing purchase orders and shop orders, so that the balances represent the quantity of materials available for future orders.

If the management is to reduce wasted labor and burden, it must receive information that is timely, accu-

SPOILED WORK

Date *March 13-1932* Order No *1675*

Part *15 A 1*			COST	
Department *10*			7 38	Raw Material
Operation *Boring*			6 01	Labor-Cumulative to this operation
Cause *Defective workmanship*			17 49	Burden " " " "
Employee *167* Pieces			30 88	Total " " " "
DISPOSITION Scrap			1 23	Salvage Value
Rework			29 65	Net Loss
Return to Shipper				Remarks *Employee ill*
Total Pieces		*1*		

Inspected By *R.A.C.* Computed By *J.H.*

Fig. 5—All the costs of a spoiled job should be kept. The above card illustrates how this may be done without a prohibitive amount of paper work

rate and complete. It should not be required to analyze a volume of statistical data to find the source and amount of waste. The form shown in Fig. 2 is being used in many shops and has proved to be effective in reporting wasted labor and burden. When these job time cards are given to the operators, the allowed (standard) set-up and operation times are indicated thereon, as well as all information called for at the top of the card. To be in a position to reduce all possible waste on this run of 100 pieces, the job time card, recording actual performance, must be calculated immediately after the first day's operation is completed.

The analysis of the calculations on this first day's run shows:

1. The operator set up the job in less time than the standard,
2. The operator took 4.5 hours to produce 6 pieces that should have taken 3.0 hours,
3. The standard labor cost, including both set-up and operation, is $2.25, and the actual payment to the operator will be $3.48 less 39 cents (that will be taken from premium earned on other jobs).
4. The foreman assigned the job to another size of machine than the one designated as the best suited for the job. This machine costs 84 cents per hour more to operate than the designated machine, thereby wasting $7.47 of machine producing value.
5. The operator of the more expensive machine carries a 10 cents an hour additional wage rate, which raises the labor cost 51 cents.

Armed with this information the management interviews the foreman before noon of the day following the operation, while the opportunity is yet at hand to reduce the wasted labor and machine cost on the balance of the run. Having put the job on the proper machine, the next day's time card, Fig. 3, looks like this:

The analysis of the calculations of these job time cards shows:

	1st Day	2nd Day	Reduction
Pieces produced	6	16	.....
Operating hours	4.5	8.0	.....
Hours per each piece	.75	.50	.25
Labor — Entire day	$3.09	$4.00	.....
— Each piece	.515	.250	$.265
Burden— Entire day	16.47	16.00	.....
— Each piece	2.75	1.00	1.75
Total Waste Reduction			2.015

The waste reduction is not as marked on the second day as for the rest of the work, because part of the second day was spent on the original set-up before corrective measures could be put into effect.

The illustration, Fig. 4, shows the job time card for one of the last days of the job. The analysis of the calculations of this job time card shows:

	1st Day	2nd Day	This Day	Reduction
Pieces produced	6	16	20	....
Operating hours	4.5	8.0	8.0	....
Hours per each piece	.75	.50	.40	.35 hours
Labor —Entire day.	$3.09	$4.00	$4.50	....
—Each piece.	.515	.250	.225	$0.29
Burden—Entire day.	16.47	16.00	16.00	....
—Each piece.	2.75	1.00	.80	1.95
Total Waste-Reduction				2.24

To illustrate the results of this operation under two costing methods:

1. *A*—A company operating without labor and burden standards.
2. *B*—A company operating with labor and burden standards for each operation.

	A	B
Pieces produced	100	100
Operating hours each	.50	.45
Total hours for the job	500	450
Cost — Operating labor	$300.00	$225.00
— premium	None	12.50
— burden	1,420.00	891.00
— Total	1,720.00	1,128.50
Waste Reduction by good costing methods		591.50

Probably the company, operating with no burden standards, would use a percentage of total direct labor to total burden for all operations as a basis for burden application to this job. Assuming its rate to be similar to the one most commonly used in plants of machinery

REPORT OF LOSS OF SPOILAGE
BY CAUSES
Period _____

CAUSES	COST								SALVAGE VALUE		NET LOSS	
	Material		Labor		Burden		Total					
Defective Workmanship	40	00	10	00	14	70	64	70	10	50	54	20
" Drawings	68	24	27	16	46	31	141	71	24	07	117	64
" Lay out		35		65	1	16	2	16			2	
" Material	36	29	50	10	58	79	145	18				78
Faulty Sales Dep. Inst.	45	00	5	10	6	30	56	40			56	40
Breakage		90										90
Total	190	78	93	01	127	26	411	05	34	57	376	48

REPORT OF LOSS OF SPOILAGE
BY DEPARTMENTS
Period _____

DEPARTMENTS		TOTAL	CAUSES						
No	Name		1	2	3	4	5	6	7
	Total								

Fig. 6—Cost analyses of spoiled work are useful in correcting sources of trouble. Above, this source of waste is tabulated by causes, and below, by departments

builders, 165 per cent of direct labor, the cost figures would show:

Pieces produced	100
Operating hours each	.50
Total hours for the job	500
Cost — Operating labor	$300.00
— premium	None
— burden	495.00
— total	795.00

Of course, this figure does not represent the facts, because the machine actually used on the job does cost $2.84 per hour to operate. Since this company does not have good costing methods, its management does not know of the loss.

Accounting for wasted capital assets, materials and labor, caused by spoilage, is important but difficult. Reporting this class of waste in quantity only, allowing the cost to be absorbed in the final cost of the finished product, does not permit the measurement of the extent of such waste until after all operations on an order are completed. Often this waste measurement is buried in such a mass of detailed figures that the effort to extract it outweighs the usefulness of the information that is received long after the operation has been completed.

Some machinery builders arrive at a unit cost by dividing the entire expenditures for materials, labor, and burden, by the good pieces produced, on the theory that the good pieces produced being all that the company can invoice to the customer, the good pieces should carry all the cost of waste. On this theory, a job for two pieces, in which one is spoiled and a new piece machined to replace the spoilage, might lead to an erroneous conclusion.

A large portion of shop spoilage is the result of inefficiencies caused by poor workmen, defective drawings, careless instructions or bad working conditions. Only a small percentage of shop spoilage is caused by the nature of the work and can be properly charged to the cost of the particular product. In measuring spoilage, it is important that all elements of cost be included. Many companies report losses of materials and labor but do not include elements which make up burden. Burden must be added to the labor cost of spoilage if the waste is to be stated correctly.

The following illustrations demonstrate the variances in results by using three different methods of figuring:

Example 1—Reporting burden by departments and individual machines (correct way)

	Labor			Burden		
	Hours	Rate	Amount	Rate	Amount	Total
Snag	0.6	0.60	$0.36	0.91	$0.55	$0.91
Plane	6.8	0.80	5.44	2.40	16.32	21.76
Bore	0.3	0.70	0.21	2.05	0.62	0.83
			6.01		17.49	23.50
Material						7.38
Total						30.88

Example 2—Reporting burden as a percentage of direct labor (incorrect way)

Labor costs as above	$6.01
Burden, 165% of direct labor	9.92
Material	7.38
Total	23.31

Example 3—Reporting no burden (incorrect way)

Labor costs as above	$6.01
Material	7.38
Total	13.39

Some contend that the burden goes on just the same whether the operation was a failure or not and that, therefore, the burden was not wasted. But the planer used in the above illustration might have worked 6.8 hours on a good part sold to a customer, thereby returning the cost as well as a profit on the operation.

The form illustrated in Fig. 5 is complete and is as simple to operate as the complexity of the condition warrants. These reports are issued by any employee that inspects the work and are sent to the cost department for calculation and reporting to the management.

A helpful practice is to have the forms provided with a rider that is used as the original when making out the report. This rider goes with the pieces and bears only the information shown on the left section of the report. In this way, the disposition of the pieces is clearly set forth, so that there will be the same understanding and action between the cost department and the employee actually handling the spoiled material. It is helpful to the management in reducing wastes, caused by labor operations, to have an analysis such as is shown on the forms in Fig. 6.

Machinery builders may not always be able to control the price at which they must sell their product, but they can all reduce waste in labor operations through costing methods, thus increasing the profits of the company. Good costing methods must be complete, accurate, simple and timely.

Effect of Pressure Angle on Gear Inspection

SAM TRIMBATH
Gear Consultant

IN setting up a gear generating machine to cut a given number of teeth, the operator accidentally used a change gear combination for one tooth less. The gear produced was inspected by rolling with a master gear on the so-called "wigglecator" and was well within the prescribed limits. In fact, it rolled so much smoother than the regular gears, that the operator was convinced that, if a like procedure were followed in producing its mate, the result would be an exceptionally fine running pair of gears. At the conclusion of the experiment, he was keenly disappointed to find he had made no noticeable improvement in the gears so far as quietness of operation was concerned.

At about the same time, complaints were received that a certain batch of gears would pass inspection using one master but were outside the limits when rolled with another. The masters were given a laboratory test for shape, spacing and concentricity and were found to be equally accurate, varying only in the matter of size, which in this instance should have only affected the operating pressure angle and the number of teeth engaged. The resulting investigation brought out that a difference should be made in the tolerances assigned gears of different basic pressure angle, or to keep the test consistent, the operating pressure angle between production gear and master gear should not vary to any great extent. As it can be shown, certain errors in gears operating at 14½-deg. pressure angle effect the indicator reading nearly twice the amount like errors effecting reading when gears operate at 27½-deg. pressure angle.

The "wigglecator" test is one extensively used for the inspection of both spur and helical gears. Fig. 1 shows the arrangement in one of its most simple forms; one gear, usually a master, revolving on a fixed arbor, the other, or production gear, on an arbor free to act against an indicator, showing the tooth errors as a change in center distance. More elaborate designs simply amplify the indicator readings, while others record the errors graphically, all working upon the same principle. When spur gears are inspected, tooth shape errors usually cause a regular fluctuation as each successive tooth goes in and out of mesh, while with thick and thin teeth or spacing errors the movement is likely to be more intermittent. Eccentricity causes a steady movement from extreme high to extreme low in one revolution of the gear. With the exception of eccentricity, these errors are more or less covered up when inspecting helical gears, as the overlapping action of the helix steadies the movements to a great extent. For this reason, only spur gears will be considered. Also for clarity's sake only the effect of individual errors will be considered, rather than to show that errors sometimes compensate each other on a composite test.

To illustrate the effect of different pressure angles in relation to certain tooth errors as shown on the "wigglecator" test, we have only to consider the relation of tooth thickness to a change in center distance. For example, assuming, Fig. 2, a pair of 5-pitch, 15-tooth gears having a basic pressure angle of 27½ deg.

3.000 = Nominal center distance
2.661 = Base diameter
0.31416 = Nominal tooth thickness
ϕ = 27½ deg. = 0.47997 in radians
tan ϕ = a in radians = 0.52057
$a - \phi = 0.04060 = \beta$

$$\frac{0.31416}{3.000} = 0.10472 = \gamma$$

reducing the tooth thickness of each gear 0.001 and meshing tightly.

$$\frac{0.31316}{3.000} = 0.10439 = \gamma$$

$\gamma - \gamma' = 0.00033$ = decrease in β
$0.04060 - 0.00033 = 0.04027 = \beta'$

From a table of involute functions:

0.04027 = 27° 25′ 45″ = operating pressure angle γ

$$\frac{2.661}{0.88758} = 2.998 = OO'$$

3.000 — 2.998 = 0.002 = center distance change

Assuming the basic pressure angle to be 14½° instead of 27½°:

Base radius = 2.9045
ϕ = 14½° = 0.25308 radians
a = 0.25862
β = 0.00554
$0.00554 - 0.00033 = 0.00521 = \beta'$
0.00521 = 14° 12′ 30″ = ϕ'

$$\frac{2.9045}{0.96941} = 2.9961 = OO'$$

3.000 — 2.9961 = 0.0039 = center distance change or nearly twice as much as for 27½ deg. By the same rule, thick and thin teeth or spacing errors would be shown in the same proportion.

In the above examples, the gears were assigned certain basic pressure angles, but the change in center distance resulted in their operating at somewhat smaller angles. We can then by the simple expedient of using

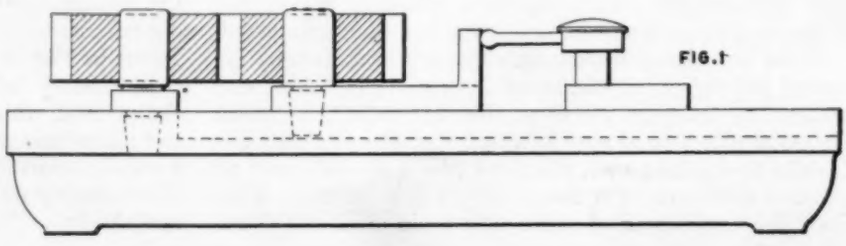


FIG. 1

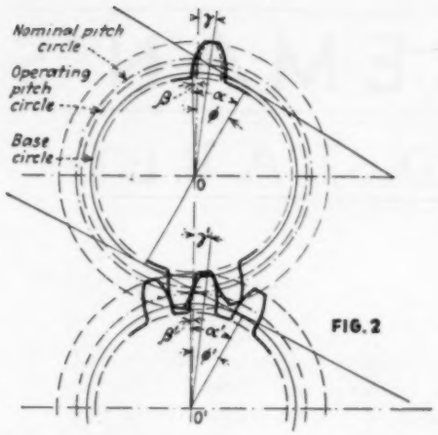


FIG. 2

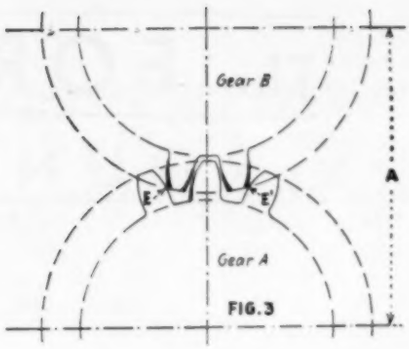


FIG. 3

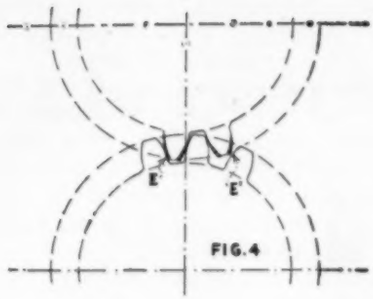


FIG. 4

one gear for a master, increasing the tooth thickness with a corresponding increase in outside diameter to assure continuity of action, inspect the 14½-deg. gears at a greatly increased operating pressure angle, thus minimizing the tooth errors as shown on the test, and by the reverse process, exaggerate the errors when inspecting 27½-deg. gears.

Within limitations decreasing, the pressure angle increases the duration of tooth engagement. If increased sufficiently, the overlap may prevent the complete registration of an error caused by one thin tooth. This would be the exception rather than the rule in spur gearing, where a minimum of two pair of teeth in engagement is not usually attained, especially in the smaller tooth numbers.

In Fig. 3, two gears of different basic pressure angles are shown in mesh. Gear *A* representing a master, the shaded profiles of the other gear *B* represent the exaggerated tooth form errors, reaching their maximum at the tops of teeth *E* and *E'*. This causes an increase in center distance *D*, which is decreased as the gears rotate in either direction to where a tooth in gear *B* occupies the central position. By increasing the operating pressure angle as previously outlined, we again tend to minimize the errors, as points of teeth *E* and *E'* (Fig. 4) may not contact at the same time.

The incident referred to in the first paragraph, where the operator generated one tooth less than the regular number in a given size gear blank, was in effect an increase in center distance. The inspection device was equipped with an amplifying lever so that 0.001 error was registered as 0.002, but the increased operating pressure angle resulting from increased center distance, minimized the errors.

The master gears referred to in the first paragraph were originally made oversize in diameter and tooth thickness. As continued use eventually destroyed the tooth shape, one had been reground several times and while theoretical tooth action was not disturbed, the reduction in operating pressure angle was sufficient to show considerable difference when production gears were tried with the two masters.

In closing, it may be well to state that helical gear inspection will more nearly resemble spur if a very narrow face master is used. Two inspections, one with full face width and the other with partial face engagement are recommended.

Plating Before Forming

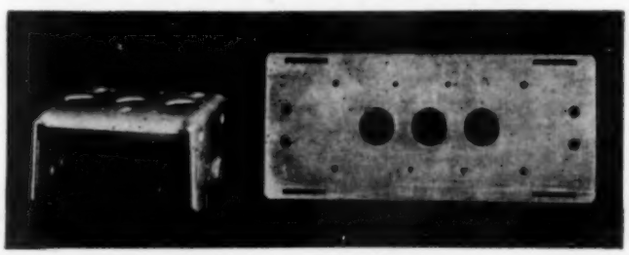
J. S. HOFFMAN
Udylite Process Company

WHERE forming or bending operations are to be done after plating a ductile electro-deposit is needed that possesses adherence and completely covers the base metal. In the accompanying illustration is shown a radio condenser frame made by American Steel Package Co. which has been formed after cadmium plating.

In this case, since the same blank is used for several different types of condensers, it would be necessary to stock approximately four times as many frames as are now carried if the frames were formed before being plated. Furthermore, as changes are continually being made, the advantage of the smaller investment in processed parts keeps down the losses that would occur through obsolescence.

Instead of plating the completed condenser frame, the flat blanked pieces are sent to a job plater where they are given a coating of cadmium. Cleaning before plating can be done much more efficiently when the part is in flat form. This is important when it is considered that a large percentage of faulty plating is caused by improper cleaning. The flat surfaces also receive a more uniform metal deposit on both sides. The plated blanks are then stamped into the desired form, and tests have demonstrated that they are able to withstand severe bending forming at sharp corners without breaking the continuous corrosion-resistant coating.

Cadium plating the blank gives better covering than if done after forming



The FOREMAN'S ROUND TABLE

A Day's Work

"Say, Ed, tell me something. Do you really get any more work from your piece workers than you do from day workers on similar jobs?"

"Why do you ask such a question as that? Of course I do; don't you?"

"I'm not sure, Ed. I'm beginning to doubt it. I have been keeping track lately, and while my piecework men are making better money than those on day work, I can't see that I am getting any more finished pieces for the additional outlay."

"Isn't that because work is slack, Al; you can't expect men to break their necks working themselves out of a job, can you?"

"I don't think that has much to do with it. There is as much work for the few men now employed as there was when we had a large force. Another thing you must take into consideration; the men that are left are supposed to be the best ones we had, and they consider it a sort of moral obligation to justify the opinion that kept them on the job. I guess I must be getting dissatisfied, but I can't help thinking that all this artificial stimulation to output is like coaxing a spoiled kid to do something. And in the end, he's just as much spoiled as he would have been if he hadn't been coaxed."

"It's your liver, Al. Or else you're losing your sense of humor. You always used to look at the bright side, but lately you've been as solemn as all get out. Snap out of it, feller."

"Maybe you're right, Ed, but I can't help thinking that things have been all wrong for some time. Honor in man and virtue in woman have been considered purely optional. If you can't avoid being honest or virtuous, all right. But don't be if you can make something by not being. Easy money and sharp practice have taken the place of contentment and conscientious effort. Pride in one's trade or position are no longer considered creditable. Pep and energy are esteemed more highly than ability and experience. True, we're paying for it, but we don't believe it and are waiting around for more easy money times. I believe we've got to come back to the honest day's work for an honest day's wage idea before we'll be prosperous or contented. None of us, workman or executive, have been giving an honest day's work. Work has been secondary. 'How can I get mine?' has been first. Now, I can't believe that a whole people can get away with anything like that. A population can support a certain percentage of beggars, but the total population can't be beggars and support one another. I believe we've got to get back to first principles. I won't charge you anything for the lecture, Ed."

"Gosh, I should say not. Say, I never saw you off your feed so bad. But what has that to do with piecework?"

"Well, I think all or most of this incentive stuff is bunk. I know enough about fatigue and psychological reactions to know that stimulation cannot be sustained. Piecework is a mental stimulation and its effect soon wears off. I know of two automobile parts shops in the same town. One is on piecework, the other on flat rate. The one without piecework has two applicants to the other shop's one. And it sets a minimum task too."

"That one must be a driver shop."

"That driver stuff is mostly drivel. All a foreman expected was that a new man would know how to do the work he hired out for and that he would do a fair amount of work for the pay he received. Now we pay a man a base rate for just coming around. We expect to educate him at our expense, and after we have done that, to pay him a bonus if he produces a fair day's work. It's all wrong. We've got to get back to honest work."

"Stop in at the doctor's on you way home, feller; you need him."

Is the stimulation of an incentive lasting? Can we with profit go back to the old day work basis? Is there a difference between driving, and compelling a fair day's work?

Discussions

The Outsider

The little experience I have had with the "outsider" proves to me that his success depends as much on the method of his introduction as on his own ability. He cannot succeed unless all the heads of departments give him their help. I bring to mind one outsider that was introduced in the wrong way. One Monday morning the shop manager was called into the managing director's office. On entering he was greeted thus: "Good morning, Mr. Brown, I want to introduce Mr. Jones to you. I have engaged him to have a roving commission inside the works. He is a specialist in organizing for mass production. I want you to take him around and introduce him to all the heads, and I wish you to inform them that they are expected to give him all the help they can and to follow out any suggestions that he may make." The manager replied that he thought it would be best if he, the managing director, called in all the heads, and laid his plans before them and introduced Mr. Jones to them himself.

"I don't think that is at all necessary, Brown. If you explain what Mr. Jones is trying to do, I think the heads will help him all they can." This method of introduction was wrong, it wasn't fair to the outsider nor to the manager and staff.

In the case I have mentioned, the outsider's temper and tongue soon upset the whole shop. In twelve months the returns were down, and the managing director sacked the outsider at a minute's notice.

—Barth Wood, *England.*

When an outsider steps into a plant, he should of course be a man who "knows his onions." It is true that not a few plants have been ruined or nearly so, after a so-called industrial engineer has introduced some new system, which eventually cost more to operate than the saving effected thereby. Therefore, if the management itself is wide awake, its best policy would be to call in representatives of the various machine tool builders, who are certainly best fitted to make recommendations concerning their particular machinery or equipment.

If, on the other hand, the management desires to revamp an entire department or shop, it is best to employ a reliable firm of industrial engineers who are capable of making a study and then offering recommendations.

—H. F. Fiedler, *Foreman, New Era Manufacturing Company.*

Traffic Congestion

Holding up of work arises through many reasons over which a foreman has no control. As a coincidence, hold-ups invariably happen when a job is urgent. Occasionally one overlooks something inadvertently. The chief reasons for a hold-up is that another urgent job arrives which can only be done on one particular machine, and someone in authority orders it done immediately. Then, too, work that helps one's own department or that of a good friend is pushed through and work for some one else is held back.

For superintendents to interfere unduly about minor things is, of course, objectionable, but I strongly advocate reports concerning the work, and were I superintendent, I should expect them. The superintendent is in a position to put wrong things right, but cannot do so unless kept in touch. He naturally wants to know all about troubles and will deal with obstacles if possible. While not expecting the impossible, he desires to judge which job shall have preference. This largely relieves a foreman of responsibility. I prefer a superintendent who interests himself in things, providing he is considerate about them.

—Wm. Bryce, *Sheffield, England.*

How Much Economics?

The minimum knowledge of economics that a successful foreman requires should include the ability to present facts and figures that give a true picture of any proposition he wishes to submit to his superiors for consideration. Less than this means that the foreman must have greater natural ability than his coforemen, or that he is just holding his job through forebearance.

The foreman, who is continually studying the whys and wherefores of his problems, is fitting himself for a bigger job.

Management should not try to educate its foremen through notices, pamphlets or talks by its own executives or accountants. It is better to bring in outsiders, who have come up through the shop and who speak its language when describing general overhead, indirect labor, running and idle machine rates, prime costs, cost of sales, distribution or any of the intangibles. It seems folly for management to believe the foremen's everyday office sparring partners can make any impression on the plant foremen.

—E. E. Gagnon.

Until we can locate around which corner prosperity is taking its long extended snooze, we are certain to hear the cry of "economize."

The study of economy is a subject that has been neglected. The average foreman knows nothing of buying, selling or values. For instance, if he knew how the prices of files vary, especially the dead smooth ones, he would see that the expensive ones were used when absolutely necessary. The same would apply to other things in daily use in the shop.

In our evening schools, we have classes for mechanics and machine drawing, but nothing to teach the business side of the trade. Perhaps some day, we shall have business classes in the curriculums of our evening schools for those engaged in the mechanical trade. That will be a momentous move toward economy.

I have known companies who will spend large sums on elaborate machinery, but be parsimonious over such small items as hammers and brushes. In some plants the stock room clerks are so close over such items as screws, that if one is lost, a man has so much difficulty in getting another that he will either steal one from another mechanic, or spend a long time in making one himself.

—S. Beaujon.

Other Times, Other Men

When prosperity makes its long looked for return, quick delivery will be the cry, and the methods of yesterday will not suffice. Many firms are expressing the opinion that their "laid off" employees will not as readily adapt themselves to new methods as entirely new men would. It is a matter of the individual, rather than whether a man has been employed

previously or not. Many "laid off" men would gladly welcome new methods, while others would always keep to their own furrow. It is usually thought that new comers are more pliable, and more ready to adjust themselves to new conditions and methods, but they are often most obstinate and stubborn when told to do a thing in a different manner. Often the newly hired man expects the plant to tune in to him, instead of attuning himself to the requirements of the firm. —T. ROSEVEAR.

The usually reliable Al has been absorbing, yet not digesting the burden of his engineer friend's forecasts and suggestions. To talk of hiring "green" men in preference to trained employees, may sound very well in theory, but in practice it simply means a lot of grief and expense for the concern making the experiment.

Admitting the fact that quite a number may have grown a little rusty through lack of practice because of layoffs and part-time schedules, it is only logical to assume that these old employees will be eager to show that they haven't forgotten the knack. Can you imagine the law of supply and demand failing to act if business makes a quick comeback? Or an efficient employment manager turning away skilled welders in preference to untrained flotsam? Many startling theories will die a natural death when business resumes an even keel.

—ROBERT S. ALEXANDER.

Functionalizing

The best answer I have found to the problem of functionalizing in terms of urgency is to use large planning boards. When a rush order arrives, there is never any secret about its being a rush job. The only secret is to know just how are we going to schedule it and forget it, secure in the knowledge that the finished goods will "graduate" in due time. This is where large scale planning boards come in.

When the order reaches the production department, it is scheduled on a card inserted in a holder on a large planning board on the wall. Date of order, date material is ordered, promised and received, date engineering work is started, etc.—all are recorded. A girl clerk continually checks these dates. When a date is passed without action she notifies the offending department head. If no result ensues she then notifies the "boss." About that time things happen.

In self-defense, the engineering department, tool room and shop will set up large boards of their own on which their functions are scheduled. They learn quickly the value of keeping their actions a permanently open book.

A control system which uses cards that can be hid in a case, or sheets which can be secreted in a book, is fine theoretically, but give me the large board which I can check a dozen times a day at a glance.

—J. K. MATTER, *Manufacturing Manager, Aluminum Cooking Utensil Company.*

Poetry of Motion

Dear Al and Ed:

I want to congratulate you both for being on your toes. When you start thinking and talking about motion study, I know that you are running your department right. Let me tip you off. When a camera is used it is called micro-motion study. When a stop watch is used it is time and motion study. Motions can be studied and analyzed with a camera, a stop watch and by visual observation.

They are all the same in theory, only in micro-motion study you use finer tools.

Micro-motion study, that is, the camera method, is used to best advantage on jobs both highly repetitive and non-repetitive. Where the jobs are non-repetitive it is used to rearrange equipment and machines, redesign tools and production machines consistent with motion economy principles. You thus have the effect of cumulative economies. On highly repetitive jobs there is no question about its efficiency. Bear in mind Al and Ed that you don't need to worry so much about the time, for when you use the right motions in their proper sequence, the time takes care of itself, and you can use a stop watch to set the time standard.

There is one thing we cannot overlook and that is its value in teaching the workmen as well as supervisors to become motion-minded. This is where micro-motion study is finding its greatest use especially in the smaller companies.

—S. B. SPONDER, *Supervisor of Time Study Engineering Latham Machinery Company.*

Overloaded

There should be no objection to asking an operator to run more than one machine if he is idle during the cutting time of a single machine. One of the most obvious means of cost reduction is to have the operator tend more than one machine. However, the machine-hour rate is usually equal to, if not greater than, the man-hour rate, and in setting up a multiple-machine job, care must be taken that the machine time lost in waiting for the operator after the cut is finished is not more valuable than the operator's time that is saved.

The timestudy problems involved are not particularly difficult. If the machine layout and the nature of the work are such that each operator has his own group of machines to tend, piece rates or task allowances for each job may be given for the handling time alone. If the set-up is such that more than one operator tends the same machine during the pay period, the piecework earnings or task allowances may be thrown into the gang's pool and distributed like any other group bonus.

—FAREL A. H. HULICK.

The number of machines that a man will run depends upon the man. The ordinary shop man likes a chance to loaf while he is theoretically working. Take away the chance to loaf, and he feels abused. It may be profitable to let these men have their way, but their rates should take into account the fact that they are loafing instead of working.

On the other hand no first-class machinist likes to be confined to one machine. A major part of his work is to plan so that he will always have something to do. When the next machine is ready for him he will be ready for it, and he will arrange the bench work to fill in the time when he has spare time from the machines. He knows just as well as the management does that for him to confine his attention to one machine at a time puts him in the class with semi-skilled machine tenders.

The first-class machinist is worth from two to four times as much as the ordinary machine tender, and he should receive the difference in pay. If this difference were made, and the ordinary machine tender told plainly why he received so much less, I think we would evolve a much better grade of machinist. —A. W. FORBES, *Forbes & Myers.*

Oil-Well Equipment Conforms to the Torch

HENRY C. FRANCIS

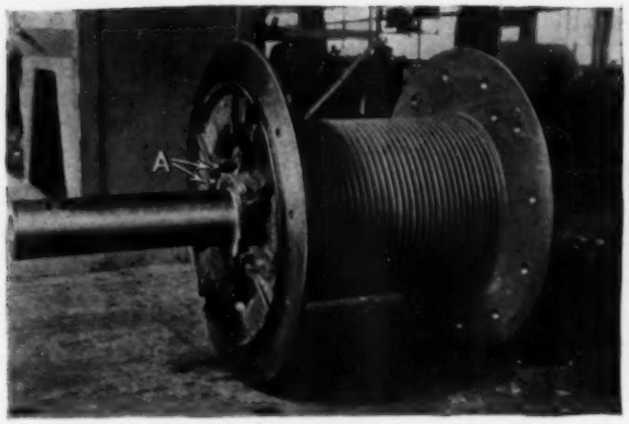


Fig. 1—Two castings make one hoisting drum

Fig. 2—Brake drums are hollow and water-cooled

WELDING found a ready welcome in the oil-well field even before its usefulness had been satisfactorily established in other industries. As in most cases, it first found favor as a method of repair but has now become an important factor in manufacturing. This is especially true in the Torrance, Calif., shop of the National Supply Company.

A good example is in the construction of the rope drum and brake shown. The drum, Fig. 1, is made of two castings, welded in the center by a continuous process, the weld being hardly noticeable after the grooves are turned. The water-cooled brake drum is bolted to the flanges of the rope spool, the water coming from the center of the shaft and circulating through the two pipes at *A*.

The brake drums are of steel plate drawn to shape and have a water space between the inner and outer surfaces. Several of these drums are seen in Fig. 2, one of the inner water connections being shown inside the drum at the left. Fig. 3 shows a detail of the water connections which are built up with the torch and then welded into place inside the rim. A wall inside the rim separates the two points of connection and compels the water to travel around the rim to the outlet, thus obtaining the maximum cooling effect. These water-cooled brake drums have proved satisfactory and do not heat unduly even in continuous service.

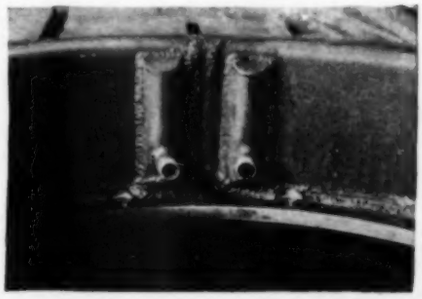
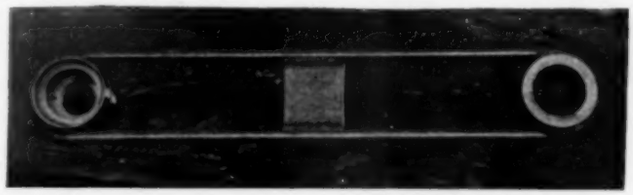


Fig. 3—Water connections are installed by welding

Fig. 4—No material is wasted in this novel connecting rod



Another example of welding which has affected the design as well as construction of the part is shown in Fig. 4. This is a connecting rod for a new and efficient type of oil well pump. The bearings are turned, grooved in the center of the outside for the tube that ties them together, and bored for the crankpins. The "rod" is built up by bending and welding. Then the bearings are located at the proper center distance and welded on the ends, and the center brace is welded in place. This construction makes a strong, light connecting rod. It is particularly appropriate for this oil pump as the frame structure is also built up of welded plates.

Industry Goes to Market

Low production schedules have directly affected the buying of industrial materials. To offset the greater burden that small inventories have placed upon his shoulders, the supplier must seek closer cooperation of the men actually using his product

THREE functions or considerations enter the procurement of materials in any manufacturing plant—design, production and that function of the managerial staff that controls or suggests proper or permissible cost, namely, that of the purchasing agent or his equivalent. Thus three considerations must always be involved in correct purchase whether they are taken care of collectively by one man, as in some small plants, or by different departments as in the larger units of industry.

The relative importance of each of these functions and how nearly they are correctly judged by the supplying organization determine, to a large measure, the expense of selling the material and consequently affect the cost of the product manufactured. The disturbed business situation of the past three years has had its effect upon the procurement policies of metal-working plants, and it was with this situation in mind that a study was made of the procedures and methods actually in use by a number of different plants. The incidents recorded here are typical of what is now going on between buyer and seller of the raw materials used in metal-working plants.

Squeezing the Inventory

After the business depression of 1921, there was much talk of keeping down inventories of raw materials in all manufacturing storerooms, and stocks were limited in most cases during the period 1922-1929 to quantities that would assure continuous operation of the machine with an added leeway to take care of any unforeseen delays in passing an order through the supplying mill.

In the large high-production plants, as for example that of the Royal Typewriter Company, the factory storeroom was located conveniently to a railway siding where the cars of raw materials were unloaded directly to conveyors, and the materials stored orderly in quantities according to kinds and sizes. Running inventories, kept on master forms in the storeroom office, showed all entries and all issues to production and served as guides for notifying the purchasing agent to order from the mills when stocks went down to definite recorded minimums. These minimums might be from a 30 to a 90-day supply, depending upon the difficulty of production at the mill and the distance of the haul. Specifications for entirely new material to go into the products were drawn up in the engineering department after consultation with the production executives, after tests in the shop, and also after arguments that were sufficiently convincing to the sales department that the new material would add to the salability of the product. This was an average first-class condition.

Now, after a full two years of decreased general business, stocks of raw materials in manufacturing plant storerooms are being kept lower than ever before. One large machine tool plant keeps its steel stock to approximately only 20 per cent of that stocked in 1929 in proportion to the relative production. One of the large plants producing screw machine parts, which formerly employed a whole building to warehouse its material and which uses many varieties of steel in many different sizes, now orders its raw materials to be delivered in trucks and distributed directly to the machine floors. Delivery from the mill warehouses in both these cases must often be made in less than 24 hours in order to prevent delays in production. In the case of the machinery builder, no advance estimates of needs are given to the mills; in the case of the small parts maker, an informatory advance estimate is given periodically on request, but no definite contracts are entered.

When it is considered that at least ten days is usually required to put through a special order of steel in the mills and that more nearly three months are required for special cases if mill schedules are to be run in orderly fashion for low cost, then it can be judged what an excessive burden has been placed upon the mills.

The Warehouse Must Guess

Somewhere the stocks of raw materials must be carried if quick deliveries are to be made, and those stocks are actually being carried by the mills or by the jobbing warehouses. One district mill warehouse in New England reports that it is carrying stocks for hundreds of factories in the territory and making daily deliveries on short notice by motor truck to points over a radius of 200 miles. But the close control of requirements is now lacking, because a mill or warehouse can only estimate requirements by what has been called for in the past, which is not always a criterion of future needs and tells nothing of changed requirements that may be brought about by changing product design. No true estimate of raw material requirements can be made except by deduction from intimate studies within the plant itself based on the probabilities in production, design and sales. Therefore, the hazard of maintaining stocks of materials based on mill estimates is greater than if the inventories were estimated in the shops, and there must be a differential of cost to cover the hazard.

The old purchasing idea in many plants was to gamble on price trends, buying at "favorable" opportunities, often loading the factory storeroom with a supply of raw materials sufficient for a year or more, which stock had to be used up even where changes in design called for cheaper or better material to replace the old.

The practice of wholesale gambling has very nearly been abolished but the pendulum seems to have swung quite far the other way. Whatever the real cause, the pressure on the factory to keep down raw stock inventories has now resulted in factory stores being transferred to the overhead of the mill and of the district jobber, and it has actually decreased the amount of intelligent inventory control possible to place over these stocks.

One important point, however, is seen as a gain in this situation. The mills have been more insistent on the reduction of metal sizes and varieties, and have added new charges for special sizes and mixtures. Designers and production men have turned more attention to standardization and classification so that one type or one size of metal might serve for the production of a number of different parts. In the case of the screw machine parts manufacturer mentioned above, the highest quality of steel that had been employed for making certain more expensive machine screws has lately been adopted as standard for all steel screws because it has decreased the number of separate items of raw materials necessary.

Price Tactics

Feverish sales methods on the part of sellers and the beating down of prices on the part of purchasing agents have characterized the advance stages of the depression period. In some cases, requests for quotations have been spread out to companies that were so anxious for business at any price that they would return quotations far below cost, and these would be used by the buyers to force companies of more reliable standing and more certain delivery to cut previous quotations. In at least one case reported, some large manufacturers had used the bids of small shops actually known to be incapable of supplying the quantity of product satisfactorily to compel large suppliers to cut under the bid which they had offered. In another reported case, on the other hand, a buyer who had sent out a request for quotations to only one company and had delayed in giving the order was called up and given a drastic cut in price to be sure to get the business. But, in general, the larger mills are no longer being swayed by the cut prices of small concerns who are selling their product only while their own low consumption gives them an excess for sale. One mill insists that salesmen have been too gullible concerning the free talk of cheaper offerings.

Purchasing agents today are not in general technically trained men. Salesmen for metal mills are likewise seldom technical men. But the technical experience of the metal producer must contact with the technical experience of the product builder if the problems likely to be encountered are going to be solved so that the best and most workable products at the lowest possible cost are to be produced.

In many small and medium-size plants, the purchasing function is taken care of by the secretary of the company, who is not usually a technical man, is sometimes overimpressed with the financial aspects of the business, and is not willing to enter into a free and open discussion of both sides of the problem of selection of a material with the shop men.

There are many complaints from purchasers that salesmen do not know the properties and possibilities of the materials they handle or their proper comparison with other and competitive materials. There are many complaints, on the other hand, that buyers place a wall of bluff and preconceived notions about them and do not permit free entry of new ideas to reach the engineers and production men. From the engineers and from the shops comes the complaint that sellers of materials try to glorify their products with fancy trade names and that they insist upon too many general claims that the materials will solve all difficulties. Both shop and engineering departments are usually suspicious of materials of which they cannot learn something of the composition and on which claims have been placed of mysterious properties.

Special Specifications

The tool-steel makers as a whole stand out as among the most openly frank in describing the content and characteristics of their steel and classifying their separate uses, trade names with them being largely offered as symbols of uniform quality. Steel casting manufacturers have also lately been publishing in their sales catalogs intelligent specifications and recommendations according to content and physical properties of the various mixtures. This may have been a defense measure against the host of individual specifications for steel that were worked up by engineers who think they should have something very special for their particular needs, but it nevertheless is a long step ahead both toward debunking the "special" idea and toward effective standardization. It is not at all evident, however, that the average purchasing agent is in a position to use this information intelligently, and judge it with the data of requirements given him by the shop. To be most effective, it must be assumed that this information on mill specifications and recommendations will get into the shop to the engineers and production men before the final choice for materials is made.

The purchasing agent of one of the best known machine tool building plants said that whenever a salesman comes in with a steel or a bearing metal and begins his fascinating story of the wonders that it will do, he calls in an engineer or a shop executive and the salesman is given a chance on the floor of the shop to prove his contentions. The practice of calling on the production man or the designer appears to be increasing.

Steel salesmen for the mills report at present a wide divergence of "contacts" or final authority for the purchase of raw materials in manufacturing plants. Perhaps the most definite trend is that of the loss of specifying authority by the purchasing agent himself. This was bound to occur as the importance of design and economy of production was appreciated by the management, but it has naturally been accentuated during the years of depression.

In some plants, especially small ones, the superintendent or even the foreman is the "last word" on the material that is to be used. But in larger plants, where the design and production functions are separated into different departments, the design and production executives each enter into the designation of the material, and the purchasing agent buys within the specification at the most economical price and most favorable terms. In such cases, any recommendation for changes in metallurgical characteristics or in sizes that would help to secure more favorable prices or deliveries are referred back

to the shop and engineering departments by the purchasing agent. In a relatively few plants, the metallurgist or physical testing laboratory executive specifies the material, but his power of specification is usually nominal, and is limited to coordinating original specifications and to the testing of shipments to assure uniformity. His recommendations are in all cases tempered by the necessities of design and the facilities for machining and handling the material in the shop.

Literature Where It Is Used

A problem of the metal supplier seems to be to assure himself that his trade literature reaches the hands of the shop executive and the engineers who have the authority to specify or to recommend a new material. The descriptive booklets now issued by many producers of steel, iron, brasses and bearing metals contain much useful information pertaining to the practical application and machining or working of the metal. It is not enough to get this literature into the hands of the purchasing agent. Announcements of the booklet are put into the trade papers and in some cases selected lists of engineers and production men are canvassed. But the present vaguenes of specifying authority makes a problem that militates against direct dealing between supplier and manufacturer. The fact seems to be that the shop men have had more influence on specification than anyone else without having had definite specifying authority. This fact is often known to the salesmen, but they neither have the access beyond the purchasing department nor in many cases do they have the technical experience to deal directly with the shop. There are radical exceptions to this, and such exceptions usually result in closer permanent cooperation leading to continuous sales. One supplier of non-ferrous bearing metals has built up a long list of permanent customers by having technically trained sales engineers contact directly with the shops in seeing that the bearings are made up properly and that they give satisfaction for the particular problem.

It is in the shop that the real proving ground lies. Complaints based on difficulties in working the metal in manufacture will naturally have their origin in the shops if they arise at all. Complaints from the field on improper functioning of the product that are traceable to the material will usually go down into the shops for study, and they offer opportunities for the first recommendations for changed materials. It is the shop supervisors and engineers who handle problems of this kind whom the material suppliers must reach with data on new and improved materials.

Giving Back the Old Man's Sight

H. C. RICKENBACK
President, Pittsburg Special Tool Company

AFTER a man spends about 25 or 30 years at such trades as engraving, die cutting, and tool making, he has attained marvelous skill, but his eyes begin to fail. He cannot see as well as before even though fitted correctly with glasses. What must he do? He must either find a way to see better or he must slip back in a few years among the ordinary mechanics.

Many men get a watchmaker's glass and through painstaking effort learn how to get the full benefit from it and thus go on for many more years, but quite a few who try it soon give it up as a bad job.

For those who need a glass, I would say to get one that is not very strong, with the idea that you will try it once in a while. After a few minutes you will discard it and perhaps feel that you never will get used to it, but have patience. After a while, use it again and repeat the procedure day after day until you feel at home with it, then use it only on very fine jobs. Later on, the time will come when you cannot do without it.

There are many kinds of glasses for this purpose, and those that suit some will not suit others at all. With the old style watchmaker's loupe, one had to learn how to hold it in his eye. But twisting your face to do that is foolish when you can attach it to a light spring that will fit around your head and feel so much more at ease. There are loupes made that hook over your glasses which have the additional advantage that your eye correction is being used with the magnifier.

Personally, I have a small magnifying disk pasted on the lower right-hand side of my right eye-glass. I believe it is the handiest way there is because it is so quickly available at all times. When using a glass you must keep both eyes open, which brings us to binoculars. There are several makes of these on the market but they all have their disadvantages. Binoculars are constructed so as to center the line of vision of both eyes, and of course, prisms are used to do this. Some binoculars are too heavy, some isolate you from your tools, and some do not make provision for those who have to wear glasses. Some of you will adopt binoculars as they give the most perfect vision and the use of both eyes and some will adopt various kinds of loupes, but remember it is better to make yourself a "slave of the glass" than just a slave.

• NEXT WEEK •

Stampings of rustless steel were required for certain pyrometer parts where precision was essential. The problem resolved itself the machining and heat-treatment of dies suited to the characteristics of the material and product. How these requirements were met is told by Walter C. Schmidt, tool engineer of the Brown Instrument Company.

Weldings require a new drawing room technique because the fabricator of steel plate needs dimensions entirely different from those used by the molder. G. B. Cramp, of the Lukens Steel Company, explains.

Bakelite has a way of closing in when tapped, which combined with its abrasive qualities, tends to shorten tool life. But Herman Goldberg, chief engineer of the R. G. Haskins Company, has overcome this difficulty as described in his article, "High Speed Tapping of Bakelite."

Government railway shops in Queensland, Australia, are shown in a second group of pictures. These views cover the boiler and rod shops.

Discussions on "Approach Cuts in Milling and Hobbing" and "Life Tests on V-Belts" are also included.

• IN A. M. •

Precision in Pyrometer Parts

Unconventional handling of several small parts has been found from experience to yield the best results

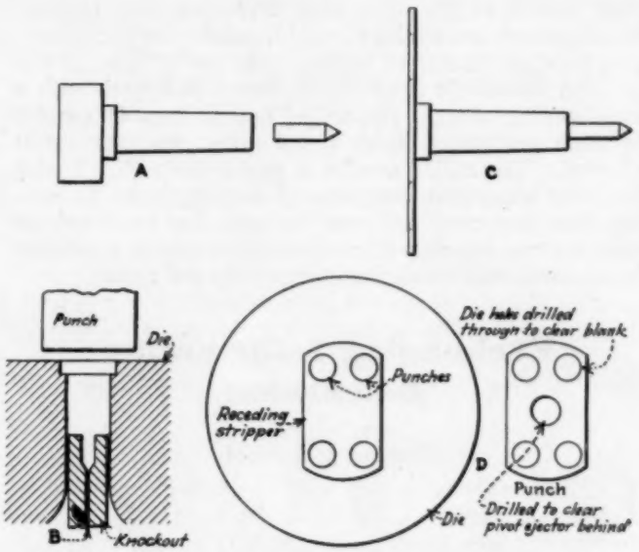


Fig. 1.—Careful attention to die design protects the pivot while the base is blanked

ONE element for high-resistance pyrometers, the pivot base illustrated, is an unusual example of upsetting and blanking to close tolerances. It is used on the movable coil element in a milli-voltmeter for the pyrometer manufactured by Brown Instrument Company, Philadelphia. The base is turned in a B. & S. automatic screw machine from aluminum bar $\frac{1}{8}$ in. in diameter, and a hardened steel pivot 0.019 in. in diameter is inset. The assembly must be accurate to a ten-thousandth of an inch.

Points on the pivots are finish ground in a small grinder before they are assembled. The opposite ends are chamfered slightly so that no difficulty will be encountered in placing them in the holes in the bases. It is interesting to note that this pivot is manufactured to much closer tolerances than are those in a fine watch. The first method of assembly was to upset and blank the base, then mount the pivot. But if the pin or hole happened to be out a few ten-thousandths, the pivot was loose, and the assembly had to be scrapped. The difficulty is now being avoided by assembling base blank and pivot before upsetting, the knockouts in subsequent operations being designed so that the tip of the pivot is protected.

Base and pivot are assembled as at *A*, Fig. 1, then placed in the upsetting die. The die is unusual in that the ejector pin or knockout is drilled to two diameters as at *B* to permit entry of the pivot and to prevent the pivot pin from bottoming. The large diameter in the knockout is carefully calculated to permit the pin to enter with a sliding fit, and is lapped to fit so that none of the aluminum may enter. Should this occur, an extra operation would be required to remove it. The rim of the die hole is grooved slightly in order to insure accurate location just above the base of the small collar which will later be staked down over the contacts. The punch is flat-bottomed, and the assembly is carried in a precision dieset. Thus when the crankpress flattens the base, it also forms the collar and expands the neck so that the pivot is gripped tightly, yet is placed to an accuracy of a few ten-thousandths. The ejector pin then throws out the assembly *C*.

The next operation, blanking and punching, is performed in a combination die *D*. The blanking punch is drilled at the proper points to act as a die for the hole punches. These holes extend upward into a single large central hole through which the punchings pass. A central hole is also drilled in for the pivot. The blanking die carries the punches and a stripper. It presents an apparently flat face to the punch as it descends, but the stripper portion recedes to expose the punches and the die cutting edge. The final operation is staking on the contact points, performed in a small jig. The pivot bases are inspected for concentricity within 0.0005 in.

Because of their smallness and accuracy several of the

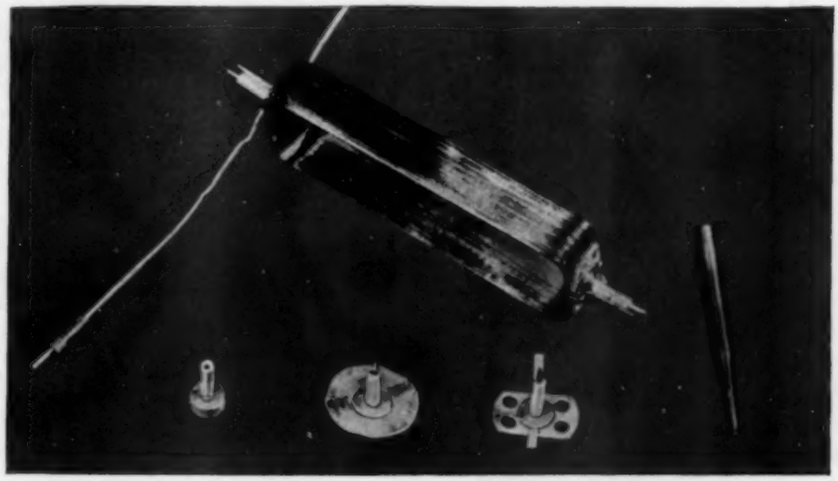


Fig. 2—220 threads to the inch are rolled on the pointer arm and the nut is threaded to fit with the tap shown at the right. Below are the progressive steps in the manufacture of the pivot base

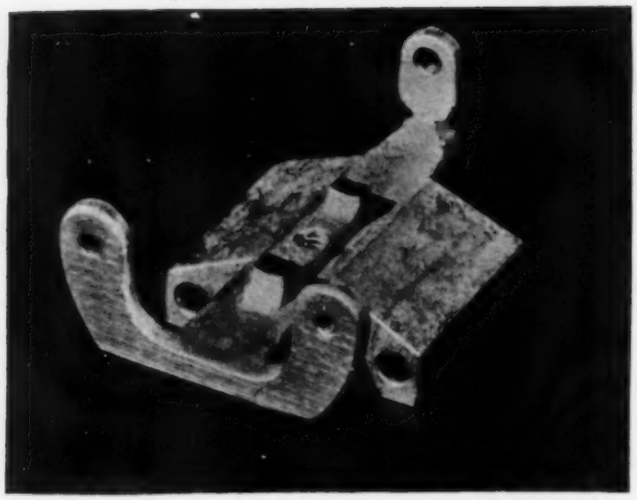


Fig. 3—A rough die casting is milled, drilled and tapped to tolerances of 0.0005 in. to make the system bracket

parts having to do with the manufacture of the movable coil are typical of the whole field of instrument manufacture.

The coil, Fig. 2, is wound from wire without support or backing. It is wound lengthwise on a cylinder provided with cover plates which hold the coil to the shape required and give it its cylindrical cross-section. At the ends of the jig in which the coil is wound are pins which carry the pivot bases. These are brought into place, located exactly, and the assembly varnished with an insulating varnish. The entire assembly is baked for several hours. When removed from the jig, the coil is flexible, yet sturdy enough to require no support. Its extreme lightness, coupled with the accuracy of the pivot bases, permits the milli - voltmeter to register infinitesimal voltages.

The arm which may be seen at the top of the coil is "just a stamping job," to quote W. C. Schmidt, head of the die department, but one end of it is swaged round and is threaded with 220 threads per inch. The threading is done on a production basis by rolling between dies in a simple crank-operated fixture. Not being able to buy the rolling dies, the company made its own, including also the chasers and taps. The taps, one of which is shown at the right, are simply threaded sections, hardened, with flats ground on two sides. They are used to tap small brass nuts, one of which may be seen on the coil assembly.

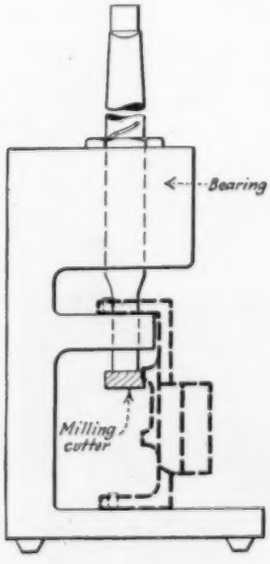


Fig. 4—Milling the bracket is accomplished by a fixture which guides the cutter and positions the work

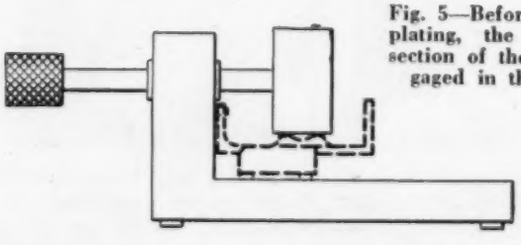


Fig. 5—Before and after plating, the cylindrical section of the bracket is gaged in this fixture

The coil operates about the system bracket illustrated in Fig. 3. This bracket is purchased as an undrilled die-casting. The holes are drilled and tapped in the usual box-type jigs. The only difference from conventional practice is that the allowed tolerance for the dimension between the tapped holes is only ±0.0005 in. After drilling, the saddle is milled as shown in Fig. 4, with a long-bearing cutter. The milled section must be exactly between the tapped holes in the arms; no tolerance is allowed. The milled section is gaged as in Fig. 3 with Prussian blue, then nickel-plated and regaged. In gaging, the plug must rub over the seat, but must neither bind nor run loosely. Upon this milled section a cylinder is mounted, and about this cylinder the coil moves.

Exchanging Information

Discussion

A. EYLES
Manchester, England

I AM strongly in accord with the views expressed by John R. Godfrey (*AM*—Vol. 76, page 215). I have fortunately been given an opportunity to visit other railroad shops and also automobile, machine tool and general engineering shops in different parts of the country. During these visits, I have studied their equipment and operation with a view to obtaining the best results in our own shop by introducing effective production methods. These visits have been most helpful, and in almost every case, manufacturers permitted complete inspection.

Some years ago a system of shop visitation was put in operation on our railroad to secure freer interchange of ideas with our various manufacturing and repair shops in different parts of the country. Two foremen were usually selected weekly to visit certain railroad shops, and on their return, furnished a written report. Needless to say many new machines have been installed and new labor-saving devices put into operation as a result.

Experience and observation lead me to state that many foremen and designers have much to learn from other shops and most of them recognize this. While there is not the opportunity for real quantity production in locomotive or car construction and repair that there is in automobile plant practice, many ideas can be picked up by the wide-awake railroad shop foreman.

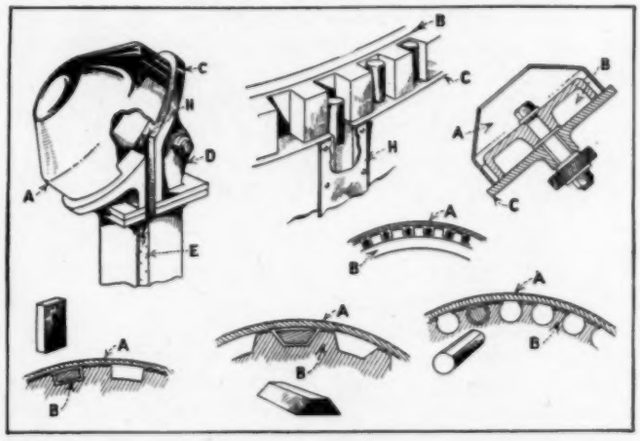
At this time especially, it will pay a railroad to encourage its master mechanics and foremen to visit up-to-date manufacturing plants to get an idea of methods and operations different from those regularly used in railroad shops. There are many machines not generally used in railroad shop practice that could be advantageously employed in these shops, and shop visits are extremely helpful in gaining knowledge about these machines. As a result of one visit, we now manufacture a small steel clip in press tools for passenger car seat springs at a net labor cost of 1d per gross against 1s 2d per gross, using hand bending machines.

IDEAS FROM PRACTICAL MEN

A Hopper for Feeding Long Parts

JAMES R. CORNELIUS
Coventry, England

In the automatic feeding of parts from point to point or from one operation to another, it is often necessary that they be delivered in some specific position. Thus a long cylinder may be fed either endwise along the chute, or it may roll sidewise along the chute. An oblong piece having a rectangular section can be delivered in a variety



of ways, as shown in the accompanying sketch, while other long pieces of various sections may be fed in a diversity of positions, varying with their sections.

With the hopper in question, when it is desired to feed any lengthy articles capable of being fed automatically, due to the regularity of section and the consistency of the sections of all the pieces being fed, such pieces may be delivered to the working position of the new station in any predetermined manner.

The four upper views of the hopper give a general impression of the appearance of the mechanism, and also the selecting method for cylindrical or rectangular pieces. *A* is the hopper container into which the parts are thrown at random. *B* is the selector plate to which is secured the container. Both pieces are revolved by a central spindle to which they are keyed. The periphery of the selector plate is machined as is indicated in the section at the right, there being two diameters, the difference between which is slightly greater than the sum of two diameters of the cylinder to be fed (assuming cylinders for the sake of illustration). In the larger diameter are machined a sufficient number of slots great enough in depth and width to receive the parts to be fed.

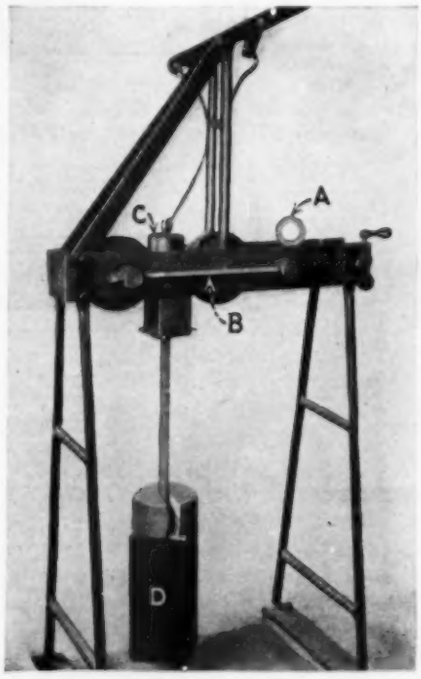
A slot is machined in the casting *C*, which is mounted on the standard *D* at a suitable angle, to take a hardened delivery block slotted similarly to the selector plate, as may be seen in the small, central top sketch. To this hardened block is fitted the chute *E*, which, with the block *H* is fitted with a cover plate to prevent the parts from falling out. It will be seen that as the hopper and the container rotate together, and that the contained pieces roll around within, these latter pieces will eventually get located in the slots in the selector plate and will naturally be located in a position according to the section of the slots and that of the pieces. If the slot is deeper than it is wide and the part to be fed is wider than the slot, but is narrower and thinner than the slot is deep and wide, then it can lodge only in that slot in one way. Obviously, as the slot passes over the discharge block *H*, the piece will fall into the chute by gravity.

By carefully considering the shape of any component of suitable dimensions that will permit it to be fed, there is usually a modification of this hopper that will accomplish the task, and in most instances the efficiency of the hopper will be more than 50 per cent. In many instances, such as with cylindrical parts that are not too long, the efficiency will approach nearly to 100 per cent of parts fed in relation to the number of slots passing the discharge slot.

A Cone-Type Testing Machine

HERBERT F. CRAWFORD

Close-grained iron is desirable in pump cylinder barrels. Since it bears a direct relation to the tensile strength, sections cut from barrels are tested on the machine illustrated. This testing machine is built up of plates and tubes, welded and bolted as shown. The section of barrel, as at *A*, is cut to give a definite cross-section. It fits over two half-round jaws, one of which is pulled away from the other by a pair of rods, one being shown at *B*. Pressure is applied by the slightly tapered cone *C* loaded with a fixed weight *D* to which uniform weights are added as desired. These weights each add 100 lbs. to the dead load placed on the ring.



The cone *C* works between the outer races of two ball bearings, the one at the left being mounted on a shaft at the outer end of the tie rods *B*. As the weights force the wedge down between the ball races the pressure acts on the test ring

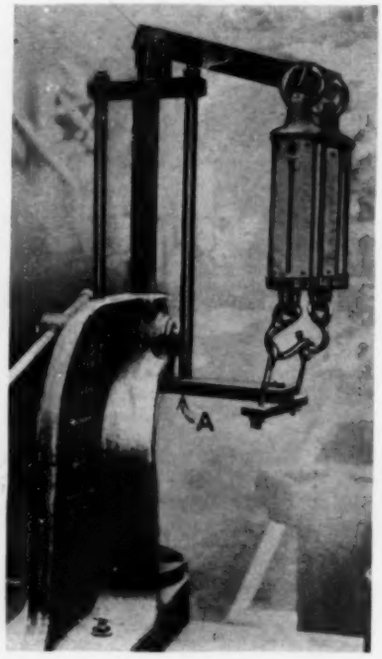
until it breaks. A substantial stirrup catches the cone on a cushion as it drops. When the machine is not in use the lever at the top raises the cone and locks it. The ball crank at the end moves the jaw that forms the anvil in contact with the ring before pressure is applied.

The ball bearings practically eliminate friction in applying the load. In fact the designer, Edward E. Stevenson, of Emsco Derrick & Equipment Company, Los Angeles, assured me that the cone would sometimes vibrate vertically just before the test piece broke.

Checking Mandrel Press Pressure

CHESTER H. FRANKLIN

Most users of mandrel presses have no way of knowing the pressure they exert. On several jobs in the Emsco shop in Los Angeles, it was found desirable to keep the pressures within fairly close limits, so the weighing device illustrated was rigged up to read the pressure on two spring scales. Pressure is exerted on the lower crossbar *A*, and the pull on the rack necessary to do the work is shown on the spring scales. The lever arm at the top has a large ratio leverage so that high pressures can be shown easily on scales with only ordinary ranges. Construction is simple, and the scales can be easily removed if desired.

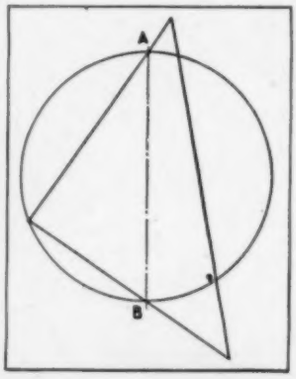


Pull on the rack necessary to do the work is shown on the two spring scales

To Set Off the Center Line of a Bore

D. Q. DUNSTONE
Hetton-le-Hole, County Durham, England

I have for some time needed a method of setting off the center line of a bore prior to cutting a keyway. It is essential that the tool used shall be applicable over a considerable range of bore diameters. I believe that the method illustrated fulfills this requirement and gives a center line of sufficient accuracy for most work. A set square is laid over the bore, the 90-deg. point contacting the edge of the bore. Two points, *A* and *B*, on the required center line are located by the intersection of the two sides subtending the 90-deg. angle of the set square with the circumference of the bore. The corner of the set square must be sharp and accurate, of course.



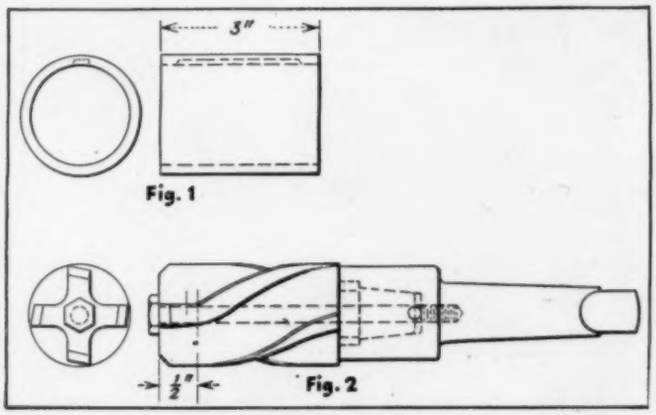
A Chatterless Reamer for Bronze

HERBERT M. DARLING
Engineer, Wells Manufacturing Company

A builder of textile machines had considerable trouble in reaming the holes in a quantity of bronze bushings, such as the one shown in Fig. 1. Each bushing had a cored groove that caused difficulty in the reaming operation. Straight-fluted reamers would chatter and catch in the groove, while right-hand helical reamers would hog in, and left-hand helical reamers would not cut freely.

To overcome the difficulty, special reamers were made as shown in Fig. 2. The holder has a taper hole to receive the shank of the reamer and has a driving recess to fit the flatted portion of the reamer shank. A draw bolt passed through the hole in the center of the reamer holds it securely in the holder. A cross-hole in the holder permits the use of a drift for removing the reamer.

The high-speed reamer has four flutes, which are straight for about one-half inch from the end, and then twisted in a left-hand helix of about 30 deg. The reamer was made from high-speed steel of reamer section, being heated and twisted to shape. This was not only the cheapest but also the only practical method of making a tool with such flutes. It was a simple job to twist the tool. A pattern was made having a recess to take the straight portion of the flutes, the casting from which



was used to hold the reamer blank during the twisting operation.

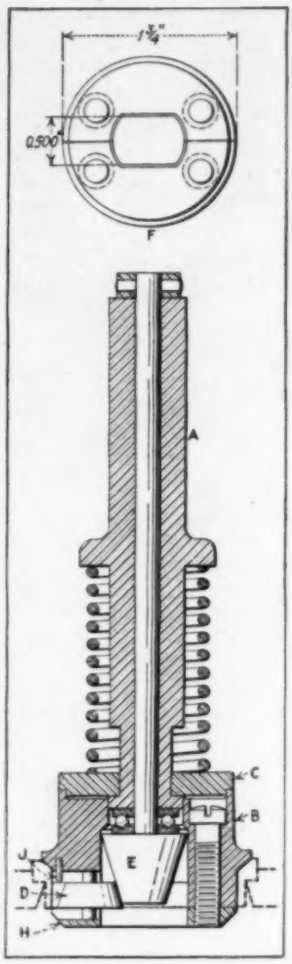
Two reamers were used—roughing and finishing The finishing reamer did a remarkably good job without chattering, hogging in, or other trouble, its use resulting in a finely-finished hole that was round and true.

Expanding Tool for Valve Seats

CHARLES F. HENRY

Many designs for airplane engines call for the insertion of a bronze valve seat in the cylinder head, and various ways have been tried for holding them in place. In nearly all cases, the seats are shrunk in place, usually

by heating the head sufficiently to get the desired expansion. In a few instances, the valve seat itself is shrunk by freezing and dropping in place before it comes back to normal temperature. The Menasco Motor Company, of Los Angeles, heats the head, puts the seat in place, and then locks it by a clever method of rolling — something like wearing a belt and suspenders at the same time.



The lower end of the bore, which holds the seat, is tapered opposite to the seat as shown in section. The expanding tool rolls the lower edge out under the bevel and locks the seat so firmly in place that it can only be removed by boring it out.

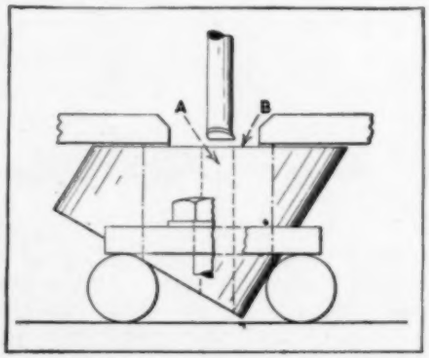
The tool has a shank *A* with a collar for retaining the spring shown and flattened at the lower end to drive the expanding rollers by means of the driving plate *F*. The three rollers are carried in the body *B* and are free to revolve and the move outward in radial slots provided in both the body *B* and the retaining cap *H*. The driving plate *C* is made in two parts and is screwed to the body *B*. The rollers *D* are hardened and have a guide pin through the center that serves as an axis. With the seat in place and the tool in position, the rollers revolve and are expanded as they roll by the cone *E* which has a ball thrust bearing above it. Stop pins *J* simply prevent the rollers from coming out of the slots.

With this tool the seats are quickly locked into place, and the method has given entire satisfaction.

Set-Up for Boring Holes at an Angle

WALTER WELLS
Die and Jig Designer,
Metropolitan Engineering Company

The cylindrical piece illustrated was to be used as a sort of pilot in a die, guiding a sliding punch to be seated in the hole *A*. Accuracy being necessary, the hole was positioned by the use of a toolmaker's button in the usual way and then bored perpendicular to the face *B*. Since the machine vise was not suitable for holding the work due to the angle of set-up, I used the method shown.

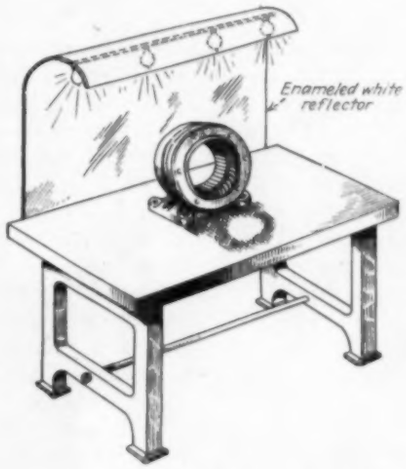


Two rods, about 1 in. in diameter and 6 in. long, were clamped to the table by straps and bolts at the ends. The cylindrical piece was then placed in the position indicated and lightly held by strap clamps, the upper face *B* being leveled. It will be noted that due to the manner of meeting, the face *B* was automatically leveled in one direction, thus saving time. Finally, the upper clamps were tightened, the button centralized by compound movements of the table, and the hole was bored and reamed to size. It is obvious that this method of setting up can be applied to any work of the type shown that is to be machined in either the jig borer or the vertical milling machine.

Light Reflectors in the Shop

FRANK C. HUDSON

Getting light inside hollow work is something of a problem. Here is the way the U. S. Motors Company of Los Angeles makes it easy for the men who put the finishing touches on the stators of the motors, where they have to see everything inside the bore. Behind the bench is a metal shield, curved at the top and carrying four incandescent bulbs. Each has an independent pull chain so that one or all may be used at will. The shield is white on the side toward the bench and reflects the light into the work in a most satisfactory manner. It is much better than putting a portable lamp directly behind the work as this glares in the eyes of the worker, even with a frosted globe.



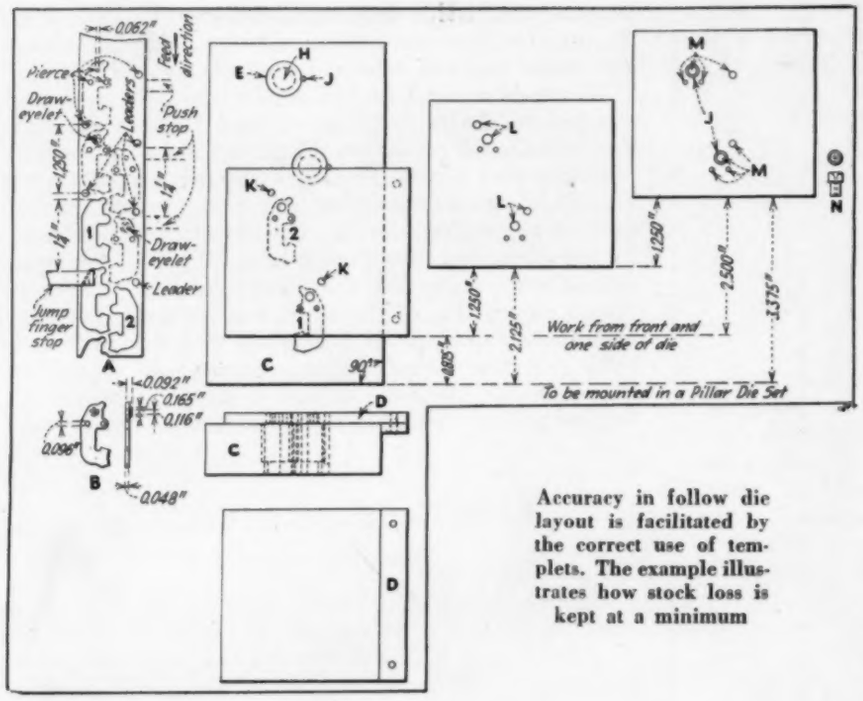
A reflector of this kind behind an inspection bench should be helpful in almost any kind of a plant. It is of course stiffened by angle or T braces riveted behind the sheet.

Accurate Alignment of Follow Dies
Discussion

CHARLES F. KRAUT

In an article under the title given above (*AM*—Vol. 76, page 62), Charles Kugler ingeniously illustrates the practical use of the square in connection with a templet for laying out follow dies. Many will agree with his statement that it pays to make a templet for such work.

An accurate templet can be used as a reference gage and can be used conveniently as a guide in making a strip-stock layout, as indicated at *A* in the illustration.



Accuracy in follow die layout is facilitated by the correct use of templets. The example illustrates how stock loss is kept at a minimum

by placing the templet in its correct position and drawing lines around its edges. The layout should be arranged so that there will be the minimum waste of stock. The method illustrated shows the definite positions of the push stops and the jump finger stop. All essential dimensions can be specified and explanatory notations can be made, no other drawing being necessary, as the punches and the functioning parts are complementary to the die layout.

The use of a strip-stock layout saves many costly errors, and the diemaker can concentrate on the actual production of the tools and proceed with precision and dispatch. The templet (not shown) is made an exact duplicate of the product indicated at *B*, with the exception that it has a 0.165-in. hole in place of the eyelet for layout purposes. In laying out the double blanking die *C*, a layout plate, as at *D*, is preferred, as both groups of holes in the blanks 1 and 2 and the leader-pin holes can be advanced as a unit, maintaining their relative positions. Thus the usual accumulation of errors that would result if they were laid out independently can be avoided.

Then proceed as follows: Prepare the rectangular die-block *C*, grind the top and bottom, also grind the front and one side square, as these are the sides the measurements are taken from. Counterbore the bushing holes *E* and drill the clearance holes *H* for the slugs to pass through freely. Make the bushing blanks a medium fit and press them into the die. Drill and ream the dowel-pin holes and fit dowel pins in position, as shown at *J*. Lay out the position of blanking holes 1 and 2, working the templet through from the back of the die.

Clamp plate *D* on the die 0.875 in. from the edge, as shown. Place the templet in blanking hole *1*. Spot, drill and ream the holes from the back of the die through the templet. Remove the templet, not disturbing the plate *D*, and place it in the blanking hole 2. Spot, drill and ream the holes through the templet and ream the leader-pin holes *K* in the plate *D* and in the die. Remove plate *D*, advance and clamp it in the next position (0.875 + 1.125 = 2.125 in.) from the edge of the die, as shown. Spot, drill and ream the holes, as shown at *L*. Remove plate *D*, advance it and clamp it in the next position (2.125 + 1.250 = 3.375 in.) from the edge of the die, spotting, drilling and reaming the holes as shown at *M*. The two 0.062-in. holes are spotted, drilled and reamed through the inserted bushing *N*. Now, all the holes have been spotted, drilled and reamed in the die in correspondence with the specifications of the strip-stock layout.

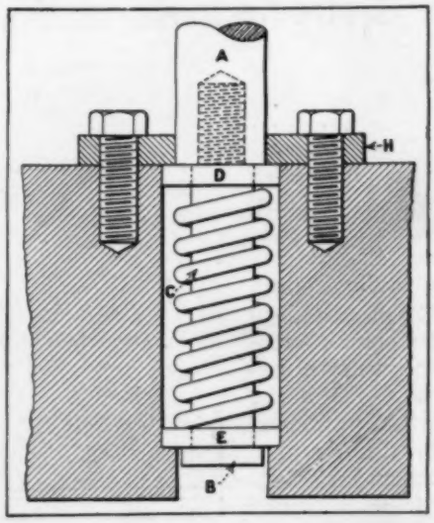
While spotting, drilling and reaming the holes gives fairly accurate results, closer limits can be obtained by using a spotting punch to locate the positions of the holes through the plate *D*, then clamping the die onto the faceplate of a lathe and indicate the located positions of the holes for trueness; then spot, drill, and bore.

Double Action by a Compression Spring

R. H. KASPER
Master Mechanic,
Steel Heddle Manufacturing Company

The sketch shows an arrangement whereby a compression spring is made to act on a rod in opposite directions with the same degree of force. The rod *A* is connected to a lever (not shown), which, starting from a given point is caused to move a given distance on each side of that point. The purpose of the spring is to resist that movement in both directions, and to return the lever to its starting point.

The rod carries the shouldered stud *B*, the spring *C* and the two sliding collars *D* and *E*. As the rod is larger in diameter than the body of the stud, a shoulder is produced, against which the collar *D* is held. Collar *E* is held against the head of the stud *B*. This assembly is inserted into a counterbored hole, the shoulder of which acts as a stop for the collar *E*, while the retaining plate *H* acts as a stop for the collar *D*. When the rod is forced

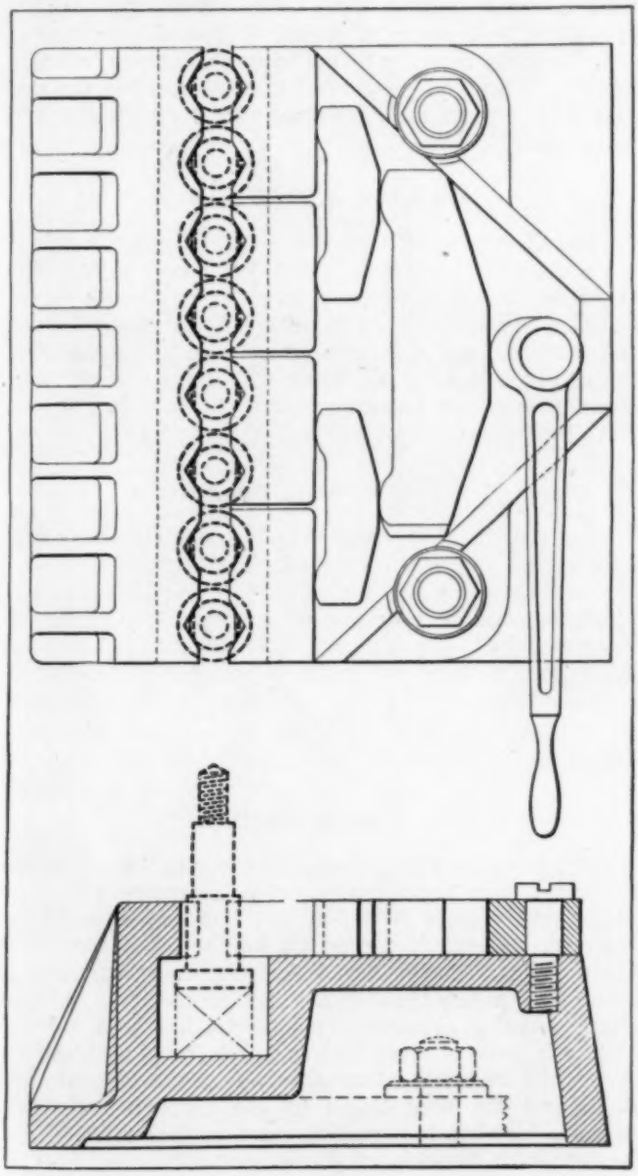


downward, collar *D* goes in the same direction, compressing the spring. When the rod is drawn upward, the collar *E* is also drawn upward, compressing the spring in that direction. As the resistance in both directions is produced by the same spring, it is equal in either direction. Collars *D* and *E*, acting against the plate *H* and the shoulder in the hole, act as positive stops.

Quick-Acting Equalizing Vises

ALY PFIRRMANN

To hold a number of small parts in one set-up on the milling machine the vise illustrated has been found useful. The work is clamped by a quick-acting cam lever which operates through a series of equalizing bars. Uniform pressure is thus assured on all the work pieces. The arrangement shown was used for machining special studs. For work of different lengths, an adapter block may be placed under the heads. Similar fixtures are also used to advantage on larger work.

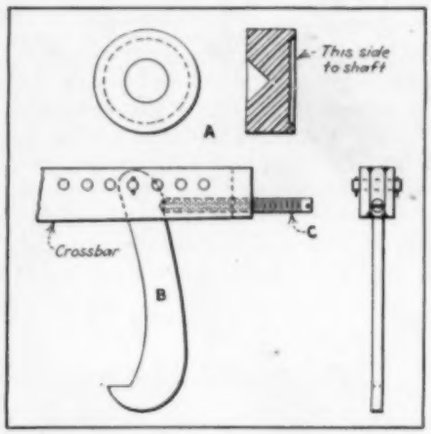


A Wheel Puller Fabricated by Welding
Discussion

GILBERT G. COOMBS
Mexican Petroleum Corporation

Referring to the article by W. S. Gallman under the title given above (*AM*—Vol. 76, page 245), while the wheel puller described therein is excellent, some of its features are open to question. To eliminate the possibility of damage to the center in the shaft, contact with it by the end of the screw should be entirely avoided. Despite a somewhat elaborate fitting on the end of the screw, Mr. Gallman's puller does not offer enough protection to the shaft center.

I have found that a steel disk machined as shown at *A* and placed between the screw and the shaft, guarantees an undamaged center without causing undue friction. Since Mr. Gallman specifies $\frac{7}{8}$-in. bolts, his puller is evidently for heavy duty. For heavy work, hook bolts are entirely unsatisfactory. Placed behind a wheel hub, they tend to open and slip off, and their use on the spokes is questionable. Further, wheel-puller arms tend to spread apart and it is essential that they be prevented from doing so.



An excellent pair of arms to suit the fabricated crossbar may be cut from steel plate, shaped as indicated at *B*, each arm to be assembled between the crossbar plates and to be pivoted upon a pin placed in one of a number of holes in the bar. The diameter of the pins need not exceed $\frac{3}{4}$ in., since they are in double shear. To prevent the arms from spreading and to adjust them to fit the wheel hub snugly, long $\frac{5}{8}$-in. screws are fitted to the distance pieces, as at *C*. The ends of the screws are pointed and the arms are spot drilled to engage them. This arrangement will prevent the screws from slipping and bending when the arms are on short centers.

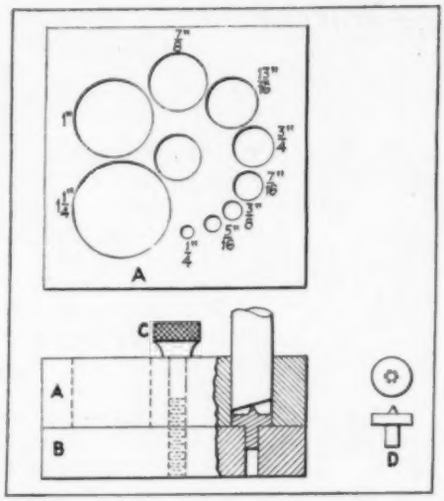
A Fixture for Center Punching

CHARLES KUGLER

The fixture illustrated was designed for center punching short work. Its advantage over the cup centers generally used for this purpose is that it centers the work accurately, regardless as to whether or not the ends are square with the body.

The two pieces of cold-rolled steel *A* and *B* can be revolved one upon the other, being pivoted by the center screw *C*. The upper piece has a series of holes of different diameters, but all at the same center distance from the pivot. The lower piece has one hole at the same center distance from the pivot as the holes in the upper piece. A number of center punches, similar to the one at *D*, are made, having heads of different diameters to

fit the holes in the upper piece, but the shanks of all are the same diameter as that of the hole in the lower piece. In operation, a center punch having a head of the same diameter is dropped into the hole in the upper piece. The upper piece is then rotated until the shank of the center punch drops into the hole in the lower piece. It will thus be seen that the center punch acts as an index pin and locks the upper and lower pieces against individual rotation, and that by tightening the pivot screw both pieces will be held firmly together.

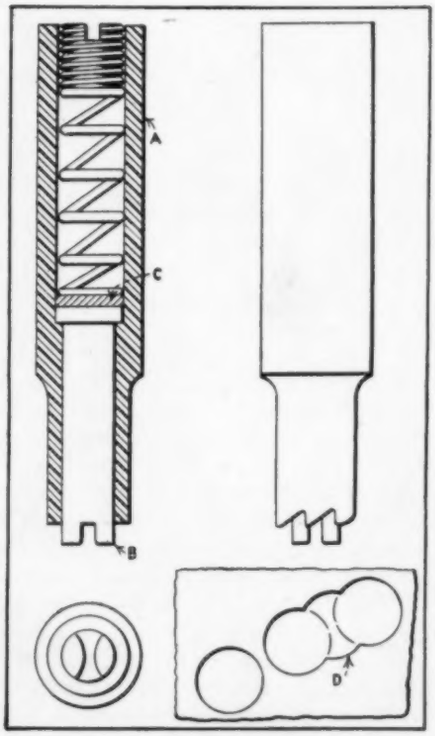


One end of the work is placed in the proper hole and the opposite end is struck by a mallet. The work is then turned end for end and the process is repeated.

A Break-Out Trepanning Tool

W. H. MOORE
Hamilton, Ontario, Canada

In our business, we often have to cut out holes in boiler plate by drilling holes close together and breaking out the metal between them. Drilling the holes is easy enough, but breaking out the metal is not, and many ways have been devised to do this work in a quick and efficient manner. Recently, I devised the tool illustrated and to my mind I think it would be hard to beat to any extent.



The hole in the body *A* is counterbored to take the shouldered pilot *B*. At the lower end, the pilot has a shallow slot of such shape that it fits over the metal between the drilled holes. The slot is tapered so that the metal between the holes does not always have to be the same thickness to permit the tool to operate successfully. The pad *C* lies on top of the pilot and above it is a compression spring. Both the pilot and the pad are a running fit in the body of the tool.

In operation, the drill press is stopped and the tool is brought down so that the slot in the pilot straddles the web of metal between two holes. The machine is then started and the tool is fed down, trepanning the web of metal. As the tool is fed down, the pilot recedes into the body until the metal has been cut through, as at *D*. When the tool is raised from the work, the spring pushes out the pilot and with it the piece of scrap.

SEEN AND HEARD

JOHN R. GODFREY

After Tumbling

Separating small parts from the compound used in tumbling barrels is frequently difficult and always rather messy. Recently a row of tumbling barrels was observed with an endless, large-mesh screen-cloth belt running in a trough in front of them. When the process is completed, the contents of the barrel is dumped into this trough. The parts are carried to a container at the end of the belt, while the compound runs through the perforations.

High Piston Production

Several companies have been engaged recently in the development of high-speed piston producing units. One is to be a multiple-type rotary machine with seven spindles which will produce pistons at the rate of seven seconds per completed unit. Previously, unit production speed for this class of work was about 27 seconds. Another company has under construction a boring machine to finish connecting rods at 1,000 per day.

Molded Weld Beads

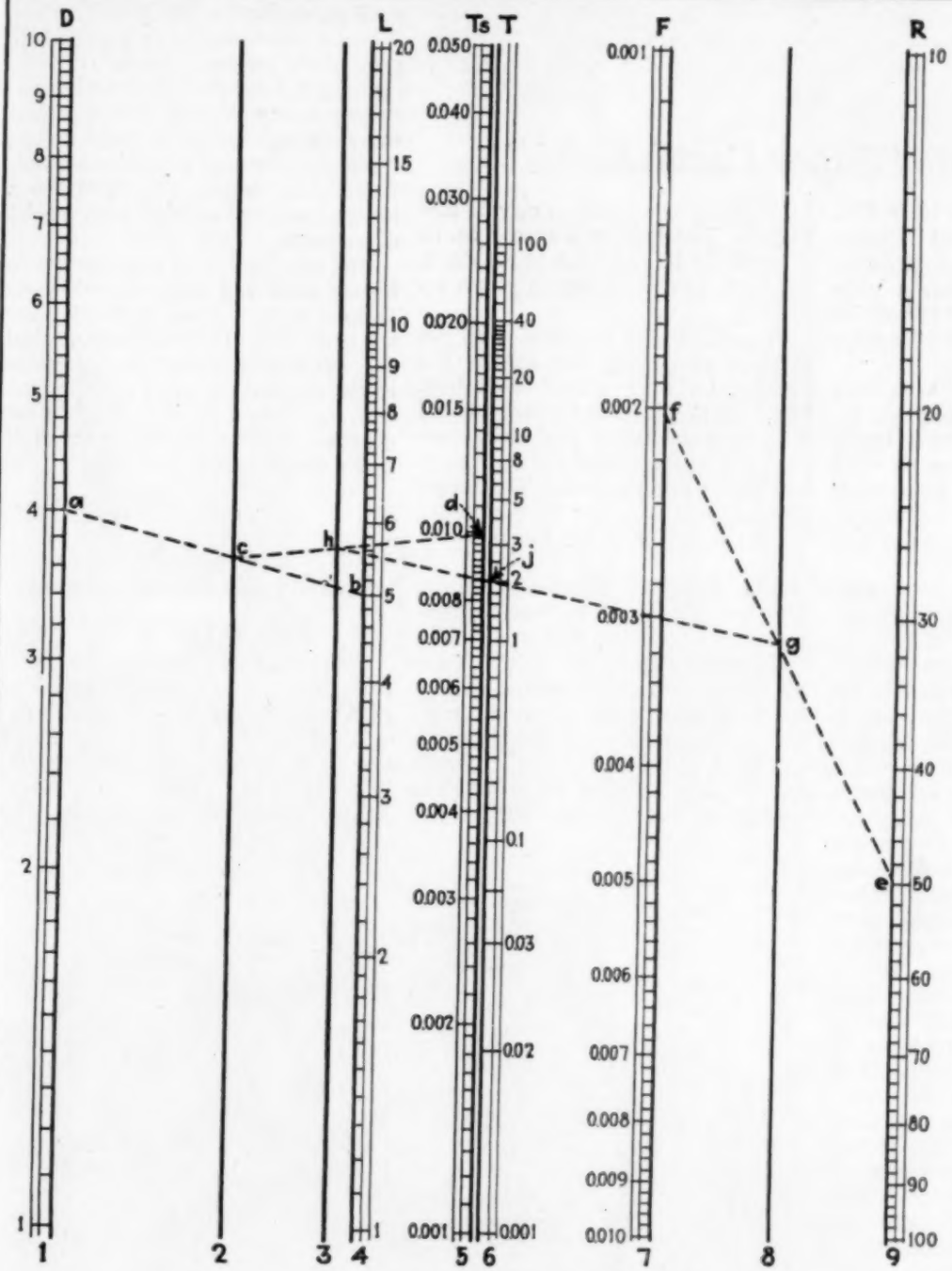
One tank manufacturer is welding tanks automatically by a rather unique process, including actual molding of the welded bead while hot. Thus the usual puddled appearance and the necessity of subsequent grinding or other machining are avoided. The filler material, according to the report, is laid in the V formed by the beveled edges of the plates. This material is welded in by passage of the automatic head, which carries a shoe with a half-round depression which forms the hot bead.

Tempus Fugit

In a large metal-working plant where long-distance telephone calls are frequent, each executive was provided with a neat little 3-minute hour-glass to set on his desk and watch during his long-distance conversations. The scheme worked well, as expected, for cutting down unnecessary "gas" that cost so much a minute. But the purchasing agent reported that it has been a boon to him in quite another manner: He found accidentally that when he toyed unconsciously with the glass on his desk, and the sand began to ebb through the three minutes, his visitors seemed to speed up their talks. Now he uses it deliberately on the many pests.

American Machinist
Reference Book Sheet

Grinding Speed Chart—Straight Shafts



Where
T = Time in minutes
D = Shaft diameter in inches
L = Length of shaft in inches
Ts = Grinding stock allowance in inches
F = Feed per revolution of the work
R = R.p.m. of the work

Formula $T = \frac{D \times L \times Ts}{F \times R}$

Example $T = \frac{4 \times 5 \times 0.010}{0.002 \times 50} = 2$ min.

GRINDING time in minutes for straight shafts may be determined from the accompanying chart. To ascertain the time of the complete cycle, an allowance for handling time must be added to the result thus obtained.

Use of the chart—example:

Let:
$D = 4$ in. $F = 0.002$ in.
$L = 5$ in. $R = 50$ r.p.m.
$T_s = 0.010$ in.

Connect value of D—Point a Scale 1—with value of L—Point b, Scale 4. From the intersection of ab with Scale 2 at Point c, draw a line to the value of T_s—Point d, Scale 5. Join the value of R—Point e, Scale 9—with the value of F—Point f, Scale 7. From the intersection of ef with Scale 8 at Point g, draw a line to the intersection of cd with Scale 3, at Point h. Where gh cuts Scale 6 at j will be found the value of T—in this case 2 min.

Contributed by Walter V. Sovitzky
Industrial Engineer, LeRoi Company

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SHOP EQUIPMENT NEWS

Porter-Cable "Super Carbo-Lathe"

ALTHOUGH the same basic idea as used in the original "Carbo-Lathe" has been retained, the "Super Carbo-Lathe" now presents a wide range of improvement. It is built by the Porter-Cable Machine Company, Syracuse, N. Y.

The bed and headstock have been strengthened by better ribbing, increased wall thickness and larger fillets. Chrome-nickel iron is used for the bed, and it is so constructed that chips fall through the center. Shears on the bed are of dovetail type with large bearing surface.

Both front and rear bed ways are identical, allowing unique set-ups. Two carriages can be used at once, one on the front and one on the rear, for rough and finished turning, or one regular carriage and one taper attachment carriage for turning straight and tapers simultaneously. Other combinations are two facing attachments, one for straight facing and one for angular facing, or any one of these attachments in combination with the other. The heavier two-piece tailstock has an adjusting screw at the rear for getting proper alignment between centers.

Drive is from a motor concealed in the base to a single-plate dry-disk clutch, which also carries a brake for quick stopping of the spindle. However, the lathe can be driven from a countershaft. From the clutch pulley the drive goes through pick-off gears at the front to a worm and worm gear which drives the spindle. Spindle pick-off gears have been widened to increase their strength 40 per cent. The worm gear drive now comes in two ratios—the low gear with a ratio of 3½ to 1, and the high with a 2 to 1.

Spindle speeds obtained with an 1,800-r.p.m. motor and low-geared head are 95 to 1,130, with feeds of 0.005 to 0.030 in. in six steps, and with high-geared head, 170 to 2,000 r.p.m., with feeds from 0.003 to 0.025 in. Variable-speed motors may be employed. The lathe will turn 7 in. in diameter by 18 in. long, and for short, chucking work will handle pieces up to 12 in.

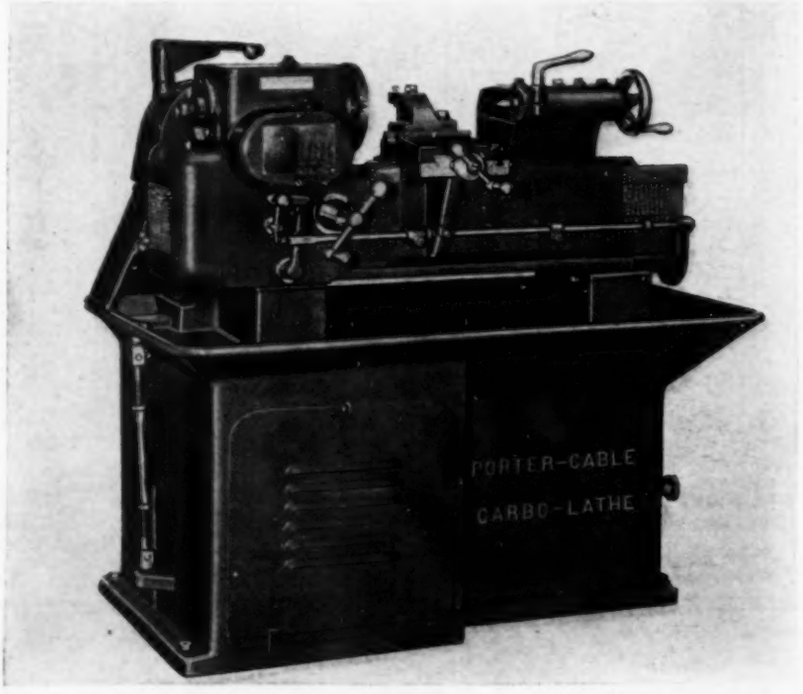
A positive stop is provided on the carriage cross-slide for setting the turning tools to proper diameters. Stops are provided on the longitudinal feed lever so that all feeds trip automatically at the end of the cut. Control levers are grouped. The motor compartment will take an a.c. motor up to 10 hp. or a d.c. motor up to 7½ hp.

The principal attachments have been redesigned. The taper attachment carriage has an 8-in. wide cross-slide, and dual springs with adjustable tension are now used for holding the slide against the taper wedge to prevent the tools from hogging into the work under heavy cuts. A universal joint is used to fasten the wedge to the carriage to prevent cramping. The facing attachment is driven from a rack in the bed, the feed pick-off gears being underneath. A cam mounted on the driven pick-off gear shaft drives directly onto an adjustable roller in the cross-slide, assuring more positive and accurate drive. A tapered gib is used between the cross-slide and frame and is adjustable for wear. The slide has a maximum travel of 2 in. with a 2-in. adjustment.

The angular facing attachment can be swiveled 180 deg., and drive is from a rack, but no pick-off gears are employed. Drive is accomplished through a forged shaft in the center of the attachment, and a crank on the upper end gives positive drive to the cross-slide with a maximum travel of 2½ in. and adjustment of 2 in.

Southwark-Emery Stress-Strain Recorder

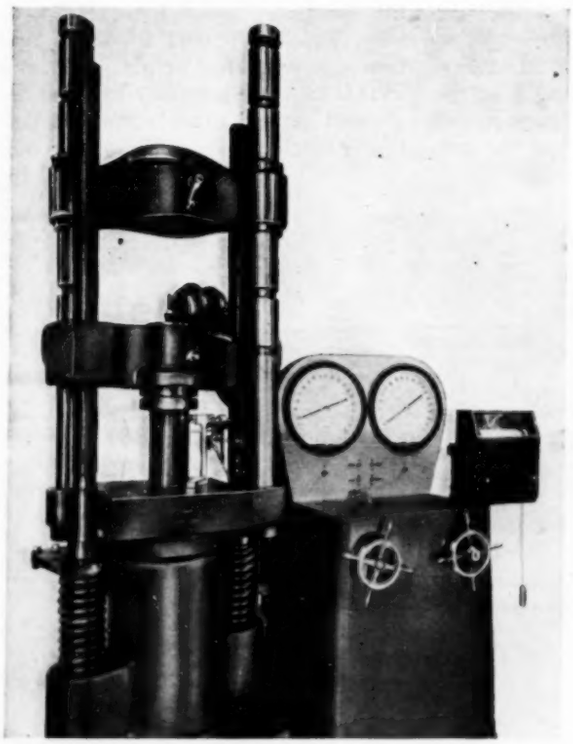
An autographic recorder that is claimed to give an accurate rendition of a stress-strain curve has been developed by the Baldwin-Southwark Corp., Southwark Division, Philadelphia, Pa. This Southwark-Emery recorder can be applied

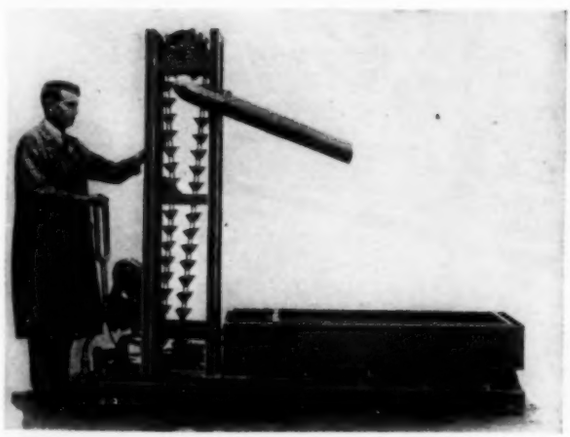


to Southwark-Emery testing machines and can be adapted to other types or makes of testing machines such as pendula or lever-and-poise. The device is shown in the accompanying photograph as used in recording the strain of a concrete cylinder by means of a compressometer. The device for the handling of tension specimens is shown on the table.

It is said that the strain values plotted by the recorder are accurate in the same degree as the average of two Huggenberger tensometer readings, mounted on two sides of the specimen bar. For any material, ferrous or non-ferrous, for alloy steels, heat-treated, normalized or annealed, the values of Young's modus of elasticity and of the limit of proportionality may be determined with precision, as well as those of the elastic limit and yield strength. It has been suggested that the elastic limit and yield strength be defined respectively as load values producing a set of 0.02 per cent and a set of 0.1 per cent of the original gage length of 2 in.

The principle of operation is based upon the use of an outside source of power (a small motor in this case) to operate the moving parts, the motion being controlled by the values to be measured. The extensometer is built under license from the Goodyear - Zeppelin Corp., Akron. The device consists of a steel frame, which is very flexible in the direction of the axis of the specimen, but rigid in every other direction. The multiplying lever and micrometer screw are mounted in a plane perpendicular to that of the mounting screws. This provides automatic averaging of strain in case of unequal extension of the specimen. The extensometer is electrically connected to the recorder. As the specimen elongates, the electric contact is broken. The relays and solenoid system in the recorder, operating upon a sensitive toothed clutch, mechanically urge the spindle to follow up the retreating contact. The follow-up force is applied at the sheave, which may vary in diameter in accordance with the multiplication range desired. A micrometer head is fitted to the spindle to permit determination of the constants of the instrument and for rechecking.





Mounting of the extensometer can be done quickly; no gage marks are required. The load element serves as a control. An Emery pressure element, by its elastic deformation under changing loads, operates a contact disk, which in turn acts upon a relay and solenoid system, a duplicate of the extensometer system, which in turn acts upon the sensitive clutch. The two similar electrical circuits are so interconnected that a single motor and transmission system furnishes power for both motions. The pencil writes the exact integration for the two test values at the same rate as the values change, moving in rapid steps so small as to cause the trace to be essentially a straight rather than a stepped line.

Abbott Ball Speed-Loader

A motor driven machine for loading burnishing balls into burnishing barrels is being manufactured and sold under license by the Abbott Ball Company, Hartford, Conn. Used in conjunction with a battery of barrels, this portable apparatus eliminates hand-shoveling and time lost in unloading and loading burnishing barrels. The unit is L-shaped and consists of a steel tower and base mounted on three casters. The speed loader is rolled into position so that the base extends under the barrel, the contents of which are emptied into a separating tray and thence settle in a hopper mounted on the base. The upper side edges of this screen-bottomed tray are flanged to rest on steel rollers mounted on the hopper. This permits easy riddling to retain the burnished articles in the tray while the burnishing materials drop through to the hopper, from which they can be returned to the barrel without removing the tray. This storage hopper is provided with a screen allowing all compound or water to drain off the balls. In fact, reloading the barrel can be started while a previous load is still being riddled.

A ½-hp. electric motor equipped with speed reducer supplies the power for an endless chain and bucket conveyor system. Levers operate four stainless-steel gates in the bottom of the hopper, and these gates prevent overloading as the burnishing materials are admitted to the malleable iron conveyor buckets controlled by a stainless steel guide sheet underneath the hopper. The buckets carry the burnishing materials to a chute at the top of the tower where they are discharged into the burnishing barrel. The loader permits serving from two to sixteen burnishing barrels, depending upon the nature of the work.

Niagara Power Squaring Shear

Smoothness and accuracy of operation, lighter reciprocating parts giving longer life and lower operating cost are features of the power squaring shear of structural-steel and cast construction introduced by the Niagara Machine & Tool Works, Buffalo, N. Y. This shear cuts ¼-in. plates in 10-ft. lengths. It is available with a 1-in. gap or an 18-in. gap in the housing. The combination of steel and cast members in the shear provide rigidity and lightness. Housings and bed are of semi-steel castings. The hold-down, crosshead and transverse bar are of steel. The crosshead is of welded construction, and is counterbalanced with large springs inclosed in cylinders. The latter facilitates the functioning of the clutch and gives more even application of power.

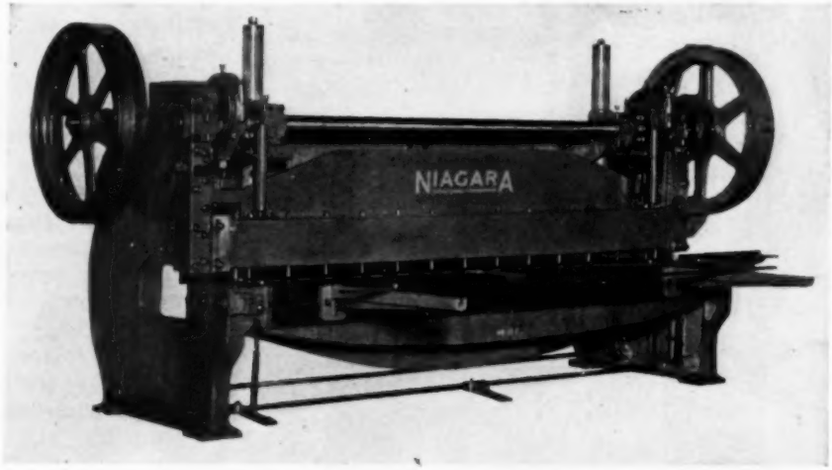
The shear is equipped with a Niagara individual spring foot holddown to assure even pressure in spite of variation in the thickness of the material being cut. It is said to be possible to cut a ¼-in. sheet and 1/16-in. sheet simultaneously at opposite ends of the shear. Hold-down pressure is transmitted to the transverse bar, relieving the main shaft of upward stress.

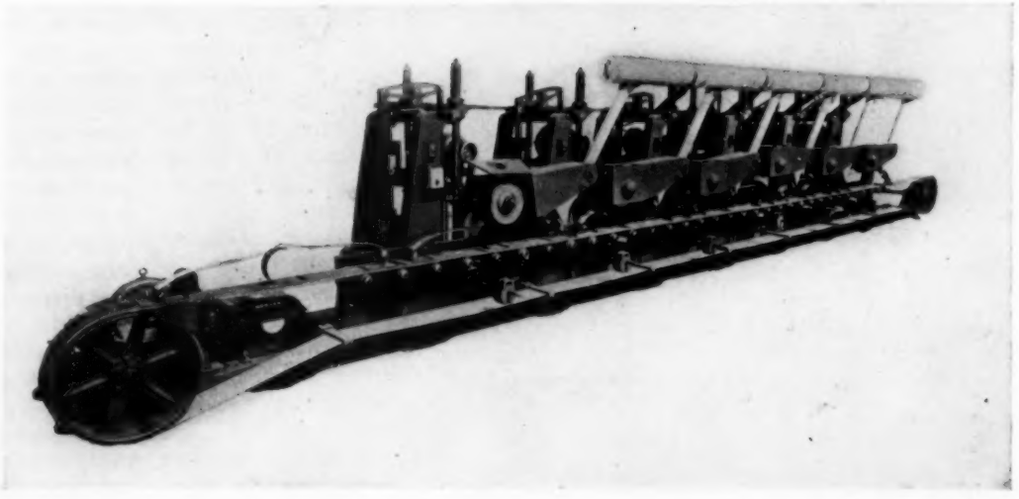
The main shaft has four bearings, two main bearings in the housings and two additional bearings located just outside the application of the load, so that the load is applied within a short well supported section of the shaft. The gears or clutch wheel and pinion have generated teeth. A full set of gages, front, back, bevel and side gages, is standard equipment. In addition, a slitting gage is furnished on the 18-in. gap shear. The back gage is self-measuring to $\frac{1}{64}$ in. and can be locked instantly in the desired position. Each end is adjustable independently.

Excelsior No. 29 Straight-Line Bumper-Polishing Machine

A straight-line polishing machine for bumpers with wide oval or corrugated face and higher curves has been developed by the Excelsior Tool & Machine Co., 30th to 32nd Sts., Ridge to Jefferson Aves., East St. Louis, Ill. The machine is built with more lift and space between the conveyor belt and polishing wheel than formerly employed to accommodate the higher-curve bumpers and also to minimize wheel friction on the precipitous ascent of the wheel. The machine is provided with a 12-in. wheel rise and heads are spaced farther apart.

Each unit is equipped with a 10-hp. motor connected to the spindle by grooved pulleys and 6 V-belts. Heavy balance weights prevent the polishing wheels from bouncing up and down the curves. Double dust spouts reduce the dust hazard. Ball bearings are applied on all equalizing connections. A Reeves adjustable speed regulator for driving the belt conveyor is another improvement. Capacity of the 14-wheel machine is from 1,000 to 2,000 bars per day, depending on the size and shape of the bumper. Floor space for a 6-wheel machine is 6 ft. by 48 ft., and the approximate weight is about 25,000 lb. The company has also developed several other automatic polishing machines for various purposes.





Each unit of this automatic polishing machine for bumper bars is driven by V-belts, and the polishing wheels have balancing weights to prevent wheel bounce. A Reeves drive controls the speed of the conveyor

"Red-E-Quick" Self-Opening Die Head

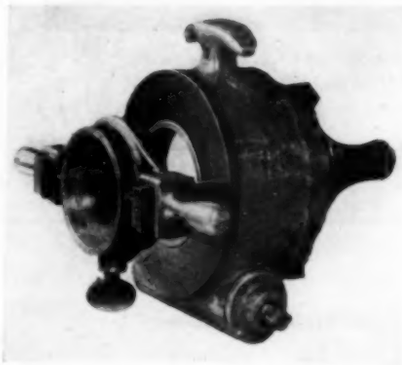
The American Die & Tool Co., Reading, Pa., has developed a "Red-E-Quick" automatic self-opening and quick-setting die head, which requires but two sets of dies to thread all sizes of pipe from ½ to 2 in. inclusive—one for ½ to ¾ in. and the other for 1 to 2 in.

The die controlling cam ring carries a notched segment, each notch in which corresponds with and is marked for a given setting of the dies. The notched segment is engaged by a pawl which, as the cam ring is rotated, engages first one notch and then the next and so on until the correct one is reached, where the pawl locks the dies in the exact positions required. Means are also provided for adjustments. When a standard length thread is to be cut a spring plunger is depressed before the dies are set. Then, when the full length thread has been cut, the plunger trips the pawl, the dies open and the pipe is free to be removed without backing off. It is said that one piece of 1-, 1¼-, 1½- or 2-in. pipe may be threaded, chamfered, reamed and cut-off in 7 min. floor-to-floor.

The above company has purchased from Hall-Will, Inc., its production tools and stock and will now manufacture and distribute the "Red-E-Hall" portable pipe and bolt threading machine with the "Red-E-Quick" die head as the feature.

Beaver No. 17 Power Adapter

A power adapter or worm-driven die stock using interchangeable die heads to thread from ½ to 2-in. pipe has been developed by the Borden Company, Warren, Ohio. This No. 17 "Beaver" adapter may be operated by means of a ¾-in. heavy-duty electric drill or by means of a compressed air drill. The adapter is for use with hand tools. It is of aluminum-alloy construction and weighs 17½ lb. On the rear it has a self-centering chuck to hold it squarely on the pipe, and on the top a grip for easy-handling. The double-ended drive permits cutting of both right and left-hand threads or to back off the adapter by power. The No. 17 unit die heads are used with the adapter, have four large openings between the dies to facilitate oiling and provide ample space for clearance of chips.



"Stearns" Small Magnetic Clutch

The Magnetic Manufacturing Co., Milwaukee, Wis., has developed a very small size multiple-disk magnetic clutch. This unit measures oniy 4½ in. in diameter and requires 30 watts d.c. for operation. The torque capacity is 600 in.-lb. The magnet is stationary and the unit is designed for use as a built-in machine tool drive.

Reliance A.C. Motors for Rapid Reversals

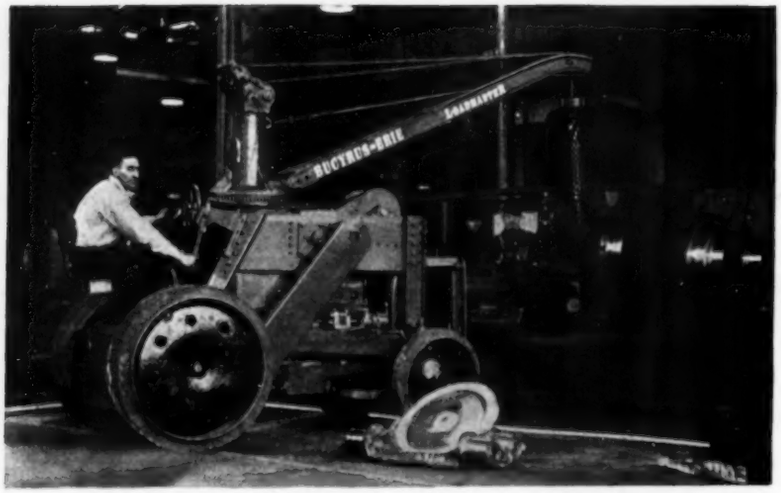
Alternating-current motors recently developed by the Reliance Electric & Engineering Co., 1042 Ivanhoe Road, Cleveland, Ohio, may be applied to driving automatic roller and catcher tables in sheet and tin plate mills, and also to machine tools such as tapping machines, broaches and motor-operated chucks. These motors are designed with torque characteristics to give rapid reversals. They may be built to reverse 40 times per minute. Low-inertia rotors are provided to keep reversing losses at a minimum. The motors are fully inclosed. Internal and external fans are made of cast duralumin. Cartridge-type ball bearings are furnished. The motors may be built so that they are interchangeable for table-tilt and conveyor applications.

U. S. ¼ In. Midget Drill

An electric drill weighing 3½ lb. and only 8 in. long, and therefore known as ¼ in. "Midget" drill, has been developed by the United States Electrical Tool Co., Department 44, 2489 West 6th St., Cincinnati, Ohio. The device is 8 in. long without the handle, which is removable. Light-duty work and close-quarter operations are the functions of the drill, which has a body of aluminum and gears of the double-reduction type. A ¼-in. screw back chuck is employed.

"Loadmaster" Crane

The Bucyrus-Erie Co., Department L-66, South Milwaukee, Minn., is now building its "Loadmaster" crane with either Case or McCormick-Deering power, and the capacity of the crane has been further increased to 4,500 lb. The Loadmaster can be

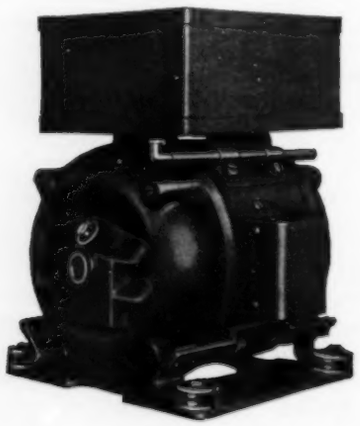


"Loadmaster" Boom Crane which is now available with Case or McCormick-Deering power

used as a stationary revolving-boom crane, as a crane traveling with its load, or as a tractor. The swing unit is useful for loading and unloading trucks and cars, sorting and piling stored material, serving machine tools, and assisting in overhauling and repair work. It is furnished with either wheel or crawler mounting.

Wagner Capacitor Motors

Supplementing its other lines of single-phase motors, the Wagner Electric Corp., 6444 Plymouth Ave., St. Louis, Mo., now offers a line of capacitor motors known as Type RZH. They are condenser-start, condenser-run, split-phase motors, the condenser capacity being varied from start to run by means of a switch and auto-transformer. In appearance these motors differ from others in the line in that a box is mounted on top of the motor to accommodate the condenser and auto-transformer. These motors are available as rigid-mounted or rubber-mounted types.



• PATENTS •

JUNE 7, 1932

Metal-Working Machinery

Hydraulic Table Feed Mechanism. George E. Hallenbeck, Toledo, Ohio, assigned to Baker Brothers, Inc. Patent 1,861,497.

Wheel Boring Machine. Sherman A. Harding, Rochester, N. Y., assigned to Consolidated Machine Tool Corp. of America. Patent 1,861,529.

Apparatus for Dividing Metal (Shape Cutting). Leo C. Shippy, Anderson, Ind., assigned to Delco-Remy Corp. Patent 1,861,758.

Counterbalancing Device for Machine Tools. Kurt H. Conley, Bridgeport, Conn., assigned to the Bullard Co. Patent 1,861,954.

Machine for Welding. Joseph W. Meadowcroft, Philadelphia, Pa., assigned to Edward G. Budd Manufacturing Co. Patent 1,861,971.

Chuck Loading Mechanism. Clarence C. Stevens, Bristol, Conn., assigned to the New Departure Manufacturing Co. Patent 1,862,042.

Routing, Milling, and Other Machine Tool. George Gorton, Racine, Wis. Patent 1,862,052.

Machine for Preparing Metal for Electric Welding. Julius R. Brueckner and William H. Gibb, Detroit, Mich., assigned to Thomson-Gibb Electric Welding Co. Patent 1,862,107.

Seam Welding Machine. Julius R. Brueckner, Bay City, Mich., assigned to Thomson-Gibb Electric Welding Co. Patent 1,862,108.

Grinding Machine. Keith F. Gallimore, Fond du Lac, Wis., assigned to the Heald Machine Co. Patent 1,862,215.

Grinding Machine. Herman F. Koestlin, Detroit, Mich. Patent 1,862,379.

Helve Operated Hammer. William A. Rockenfield, Rochester, N. Y., assigned to High Speed Hammer Co., Incorporated. Patent 1,862,431.

Tools and Attachments

Boring Head. Robert L. Hibbard, Bellevue, Pa., assigned to William K. Stamets. Patent 1,861,498.

Adapter for Machine Tools. Arthur C. Maxfield, Cranston, R. I., assigned to Brown & Sharpe Manufacturing Co. Patent 1,861,504.

Die. Charles R. Leiter, Rochester, N. Y., assigned to Consolidated Machine Tool Corp. of America. Patent 1,861,538.

Die and Punch. James Vehko, Detroit, Mich, assigned to the Murray Corp. of America. Patent 1,861,648.

Chuck. George E. Garno, Worcester, Mass., assigned to the Heald Machine Co. Patent 1,862,216.

Chuck Device. George W. Emrick, Brooklyn, N. Y. Patent 1,862,370.

Boring and Tapping Tool. Wilhelm Birtel, Dusseldorf-Rath, Germany, Patent 1,862,461.

Processes

Process of Electroplating. Oscar L. Maag, Canton, Ohio, assigned to the Timken Roller Bearing Co. Patent 1,861,446.

• TRADE PUBLICATIONS •

AIR CLEANERS. Catalog A, issued by Leavitt Machine Co., Orange, Mass., describes the Swendeman automatic separator for removing oil and water from compressed air. Suggestion for connection, a list of applications and various other data are included.

CRANES. The Bucyrus-Erie Co., Department L-66, South Milwaukee, Wis., has issued a bulletin "Saves You Time and Money," explaining the action and showing many pictures of its Loadmaster boom crane in action. Capacity, working ranges and specifications are also given.

MANUFACTURING EXPENSE BUDGET. Among publications issued by the Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., is the report "The Manufacturing Expense Budget," which is based on the budgetary practices of many industrial organizations. The several types of budget used for control of manufacturing expense are described and illustrated, and the complete procedures of four companies are outlined in some detail.

MOTORS. Wagner Electric Corp., 6444 Plymouth Ave., St. Louis, Mo., has available a six-page loose-leaf bulletin on capacitor motors Type RZHR (rubber-mounted), and RZH (rigid-mounted), known as 167, Part 6.

EDITORIALS

June 16, 1932

K. H. CONDIT • F. H. COLVIN
Editors

Productive Relief

As this is written, an appeal is before Congress for the kind of relief for the heavy industries that was advocated on this page last week. Mr. Houston of the Baldwin Locomotive Works, appearing before a Senate committee, argued along much the same line as did our editorial, pointing out that the heavy industries are responsible for the major portion of unemployment. Mr. Muir of the McGraw-Hill Publishing Company followed with an estimate of the sums that could be used to advantage in modernizing existing obsolete equipment in industrial plants and on the transportation systems.

We are entirely convinced that loans made available by Congress for this particular purpose would be many times more productive of real unemployment relief than would several times the amount spent on more or less necessary post offices as proposed in the Garner Bill. Most of the money loaned for equipment replacement would eventually go into wages, because the labor factor in the building of equipment is considerably higher proportionately than in the manufacturing of any consumer goods where lots are large. Equipment —machine tools, looms, paper machines, ice cream machinery, locomotives, turbines—is built in small lots as a rule, hence the higher labor cost, and the greater effect in relieving unemployment.

Another vitally important factor in the situation is the effect such loans would have in encouraging equipment purchasers who have the money, but are still fearful that the time to buy is not yet, to go ahead with planned programs.

Possibly, by the time this editorial appears, some action will have been taken at Washington. If not, every reader of *American Machinist* will help his country and himself by doing his utmost to advance this important relief legislation.

Sound Sense

An unimpeachable authority tells us that one railroad president has issued orders that one-third of his idle motive power be considered ineligible for repair. This is just another way of saying that he has very wisely decided to scrap some of the equipment he has that is not worth repairing. If only he were not the exception to the rule, among railroad presidents and among heads of manufacturing industries. Inadequate, obsolete locomotives, machine tools, generators, looms mean high cost, unsatisfactory production of transportation, metal products, kilowatts and cloth. It is sound sense to write them off the books and send them to the cupola.

Tool Cost Versus Unit Production Cost

Extravagance in tooling is something that every production shop executive might well look into during these days of cutting corners and getting down to an efficient basis. Here is an example: An automobile manufacturer had a special model coming out with a trick seat requiring a support riveted in a peculiar way. The entire schedule called for only one hundred and fifty of this model, but the tool engineers designed tools to do the work at an estimated cost of eight hundred dollars. A wise master mechanic figured that this meant a tool cost of five dollars per unit, and that a workman with standard hand tools could do the job at a labor cost of eight cents per unit. Needless to say the machine was not built, but the design cost was lost.

Tool designers are not economists nor cost accountants. They naturally want to design good and clever tools to avoid being criticised for proposing cheap or sloppy jobs. This case is not an unusual one. Similar extravagances occur every

day with tools and special machines that are made too elaborate for the number of parts to be made and the length of service required.

Why build machines and tools that will last ten years and turn out a million pieces if only a hundred thousand are wanted during a period of one year? This is where the production executive must step in and add the tool costs that are charged against his work to the new labor costs to see what he is saving or losing. Tools should be measured by the cost per item of production not by the pride of the tool designer.

• CHIPS •

Headed by Secretary Mills, industrial leaders urge the Senate to make the increased R.F.C. funds available to private industries—for modernization by the purchase of capital goods . . . "no other way to get men back to work immediately" says Baldwin Locomotive head, George H. Houston . . . Malcolm Muir estimates industrial spending at $1,000,000,000 if funds are provided . . . Tax measure becomes law as President signs it 1 hour 38 minutes after passage in the Senate . . . Now it's up to citizens to pay the bill . . . Badly mangled, the economy plan reaches conference with savings cut to $186,000,000 . . . Pay of 2,000 army officers restored to War Department appropriation . . . Out by June 27 is the present Congressional aim . . . Democrats will get to their convention . . . and the populace will join legislators in a deep sigh of relief.

General Motors head Alfred P. Sloan joins John D. Rockefeller, Jr., in urging repeal . . . but Hoover is likely to limit Republican plank to resubmission . . . Dr. John R. Mott, Y.M.C.A. leader, would give youth a voice in wet issue . . . Though disowned by both the Legion and V.F.W., the bonus army refuses to quit Capitol . . . "Turning point toward eventual prosperity seems to have been reached," says Charles G. Dawes, resigning from R.F.C. . . . but friction with Reserve Board head may be contributory cause.

Dun and Bradstreet see rise in retail trade, noting return of confidence in buying public . . . Reserve member banks gain $22,000,000 in loans and investments . . . $44,000,000 new heavy construction for week of June 6 sets the year's peak . . . contracts reported for May in sixteen Southern states amount to $35,000,000.

Today the Lausanne Conference convenes, hoping to end trade stagnation . . . reparations the chief topic . . . League delegation to advise return to gold standard . . . Austria gets credit of $42,000,000, guaranteed by eight governments . . . Moscow seeks new $1,600,000,000 internal loan to finance fourth and last year of Five-year Plan . . . workers to contribute three weeks' pay . . . Soviet offers credit of $8,000,000 to Turkey, setting another precedent in capitalistic policy . . . Unemployment in Germany drops 92,000 in two weeks . . . in Poland, decrease of non-workers for one week is 9,499 . . . Unpopular as elsewhere is economy in France . . . Herriot's 10 per cent cuts arouse angry protests.

Columbia University proposes a $7,000,000 30-story college building on its campus in New York . . . Kansas City plans a $3,000,000 city auditorium . . . A $1,000,000 refinery expansion program is being pushed by the Marathon Oil Company . . . $1,315,000 will be expended on a 1247-ft. reinforced concrete bridge over the Saugus River.

G. B. Cortelyou, Consolidated Gas head, elected president of N.E.L.A. . . . Southern Pacific requests I.C.C. approval of $35,000,000 loan . . . Cincinnati Union Terminal wants $11,400,000 . . . and New York Central $13,600,000 . . . Westinghouse employees selling campaign nets $1,500,000 in May . . . stock holders now enlisted . . . other concerns to follow suit . . . G.M. stockholders increase 13,852, now totaling 359,046 . . . U. S. Steel to use E.G. Budd system of stainless steel construction, including shot welding . . . Bethlehem F. & M. makes 5-year contract to make equipment of Oil Electric Engineering Corporation . . . puts on 300 men . . . Carnegie Steel resumes Youngstown operations after 2 weeks shutdown 2,500 men return to two blast and six open-hearth furnaces . . . Auburn cuts car prices and will introduce new low-price line . . . 1,600 men put to work on motors at Lycoming . . . Toledo-Owens Glass Co. adopts a 6-hour 4-shift day . . . increases force by 2,000, making 8,000 total . . . G.E. produces 10,000,000-volt spark, 60 ft. long, at Pittsfield . . . United Action Drive to put 1,000,000 men to work reports 907,420 employed . . . in 3,116 towns and cities.

· REGIONAL · REPORTS ·

DETROIT—Everything points to continued automotive production through the summer and increasing model changes. One alarming thought is besetting the trade; that is the intention of several of the companies to market cars stripped of all gadgets and accessories in order to compete in the lower price classes. Several producers have already announced such cars and others are coming, directly reversing the trend in 1932 models. Two factors offset the likelihood that this will mean a reduction in machinery and machine-tool orders: the probability that such a move will stimulate buying and the general introduction of mid-year models almost certain to follow.

Contract jobbers continue to enjoy work in driblets, with a fair prospect of increased orders. An air of expectancy is noted at one of the largest producers which is preparing an aggressive program. This may or not be translated into business for the trade during the summer dullness but dealers are not entirely pessimistic.

CHICAGO—No sign of improvement in the local machine-tool market is apparent. A few occasional orders are being placed. Inquiries are light. Machine tools up for auction are being knocked down at extremely low figures, and used tools fare very poorly. Railroads show little interest and only one is in the market for a few items.

CINCINNATI—The recent development of better team-work on the part of the Congress gives hope to some that this will cause business to regain courage and come out of hiding At this time, however, the sales-level remains unchanged, and answers to inquiries, of which there are a fair number, do not bring much response.

MILWAUKEE—Outside of a few scattered inquiries and an occasional small order, business in the local machine tool market is dull and quiet. Some interest is found among manufacturers of diversified lines, the automotive trade and for government aircraft requirements, but the inquiries do not materialize. General business conditions are prognosticated for improvement during the next few months, and this is expected to reflect in a gradual come-back in the machinery and machine-tool industry. However, no one seems inclined to make predictions.

TEN days have elapsed since the passage of the Tax Bill but as yet the full effect of the "Great Squeeze" has not been felt. Certain it is, however, that the chances for sale of "producer" goods has not been helped, and close attention and co-operation on the Mills suggestion for extension of credit by the R.F.C. are needed. Many of the excise taxes cannot be passed along handily by manufacturers, and this will reflect on their equipment-purchasing policies. Doubly drastic is the burden on the automobile manufacturers because it is estimated that this industry will carry one-fourth the load. It must be remembered, however, that several companies are to lock horns in the "stripped car" field where only large-volume economical production will bring home the bacon, and that some of these concerns have bought very little equipment in the last two or three years or longer. According to the N.M.T.B.A., only a sprinkling of orders and a little foreign business were the lot of the machine-tool builders in May, and the total volume was off from April.

DETROIT placed several orders of moderate size during last week. Model changes are looked to for orders in the Summer. Cincinnati maintains the same low level and inquiries are listless. Milwaukee reports an occasional order. Chicago finds no sign of improvement and witnesses auctions of tools at ridiculous figures. Los Angeles has experienced some improvement among specialty shops but none among dealers in machine tools or shop supplies. New England is still optimistic, but trade drags along. New York has nothing to report in the way of sales.

PACIFIC COAST—Little change is to be noted in the business situation in Los Angeles and vicinity so far as concerns the machine tool and shop supply lines. Certain specialty shops have experienced some improvement in their respective lines of work though this is more in the way of special jobs than in production work.

NEW ENGLAND—Orders are few and usually for inexpensive machinery. Any inquiries received express small hope of immediate orders. With continual retrenching on every hand there remains very little on which to build a hopeful future.

Executives here and there find indications that bring forth optimistic expressions. At any other time such anticipations might be fairly certain of fulfillment. But the very long tedious drag of low levels of business such as all industry is now experiencing is apt to be conducive of hope.

NEW YORK—All sources report an entire lack of business during the past week. It is probably true that this section had slightly more business during the past few months than at least one large metropolitan center. Now, the only comfort in the situation is that it could not be any worse, and consequently dealers are emboldened to bolster themselves up with hope.

MATERIAL TRENDS AND PRICES

Metal prices in general remained unusually steady during the week. Tin, New York, continued to decline, dropping 1.25c. per lb. to 19.25c. Zinc, in declining 0.05c. to 2.80c. per lb., East St. Louis, lost part of its 0.25c. rise of the previous week. Electrolytic copper, Conn. gained ¼c. to 5.375c. per lb. Ferrous metals. fuel and scrap show no tendency to change.

(All prices as of June 10, 1932)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$11.00	$11.00	$12.00
Buffalo, No. 2, Fdry., per gross ton	16.00	16.00	17.00
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	9.50	9.75	10.30
Furnace Coke — Connellsville, per net ton	2.00	2.25	2.40
Foundry Coke — Connellsville, per net ton	3.00	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb	1.60	1.50@1.60	1.65

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Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago	4.62½	Cleveland	4.50	New York	4.75
Cincinnati	4.35	Detroit	4.00		

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot-rolled, No. 10	1.55	3.20	3.00	3.00
Hot-rolled, No. 24*	2.20	3.55	3.25	3.50
Galvanized, No. 24	2.85	4.10	3.75	4.00

*Annealed

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches						
		⅛	¼	½	¾	1	1¼	1½
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.80	3.60	3.60
Cold fin., round or hexagon	3.30	3.10	3.10
Cold rolled strips	4.95	5.95	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.55	3.50
Rivets	4.00	3.30	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except stove), nuts, and lag screws, mill lots 75%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn	5.37½
Copper wire, base, Chicago and Cleveland	8.12½
Copper wire, base, N. Y.	8.00
Lead, pigs, E. St. Louis	2.90
Tin, Straits, pigs, spot, N. Y.	19.25
Zinc, slabs, E. St. Louis	2.80

Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:

Brass rods, high	9.75
Brass sheets, high	12.00
Brass tubing, high	15.25
Copper, drawn round	12.37½
Copper sheets	14.87½
Copper tubing	14.37½

Prices following are in cents per lb., del. from N. Y. warehouse:

Babbitt, anti-friction, general service	27.00
Babbitt, com'l, intermediate grade	32.75
Babbitt, genuine, highest grade	43.00
Solder, bar, 40-60	16.00

Prices following are in cents per lb., base, Huntington, W. Va.:

Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	1.75	1.25	1.50
Light brass	1.25	1.00	1.25
No. 1 rod-brass turnings	1.75	1.75	1.25
Heavy copper	3.50	2.50	2.62½
Light copper	2.75	2.25	2.12½

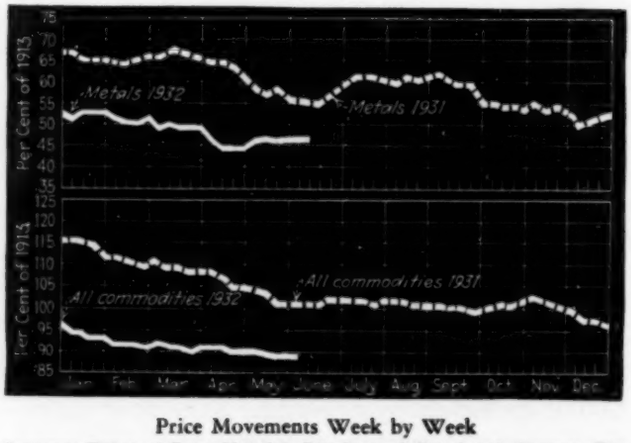
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, in 150-disk lots, per 100	$3.48	$3.48	$3.48
Belting, leather, heavy	40–5%	40–5%	40–5%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60–10%

Lumber — Per M ft., b.m., 12–16 ft. lengths, delivered, N. Y.

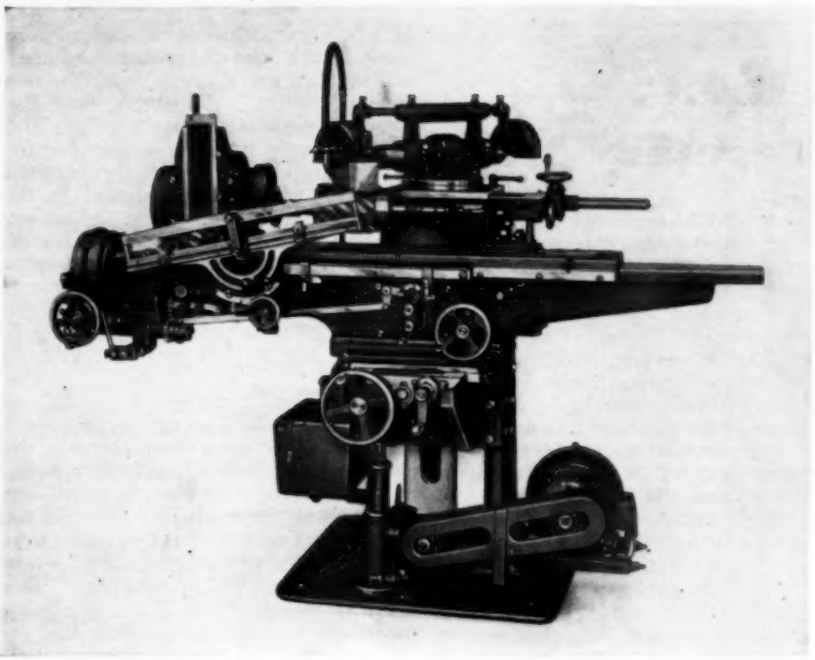
Crating — Southern pine:
1x4-in., sq. ed. ..... $27.00 1x6-in. $24.00

Skids — Spruce:
2x4-in. .$35.00 3x4-in. .$35.00 4x6-in. .$37.00 6x6-in. .$50.00


Per Cent of 1913
Metals 1932
Metals 1931
All commodities 1931
All commodities 1932
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

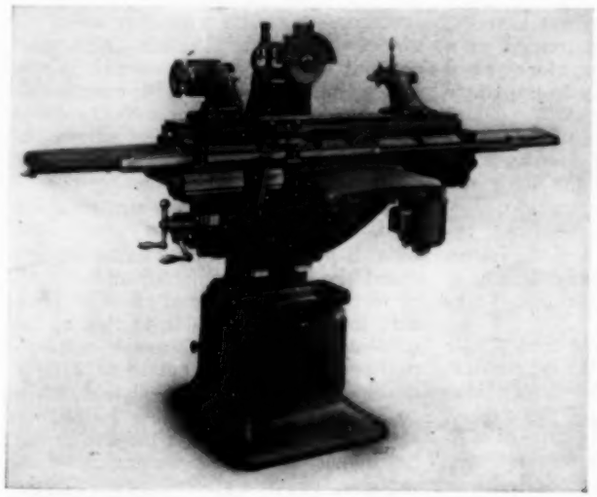


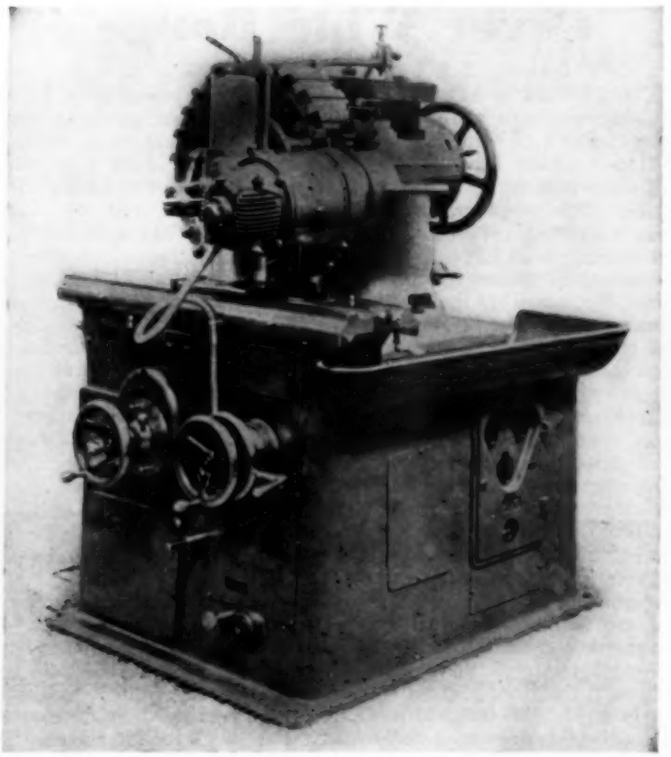
This fully automatic cutter grinder is adapted for grinding or sharpening straight or tapered cutters with straight or helical cutting edges. It will also grind helical cutters on the front and back faces, and with additional attachments, grind angular cutters, end and slab mills, cutter heads, reamers and taps. Drive for both spindle and table are taken from one motor. Indexing is effected by a special dividing apparatus acting at the ends of the table strokes during the dwell. Compensation for stock removal and wheel wear is made automatically by differential grinding-pressure regulation. Table swivels 15 deg. Cutters up to 45 deg. spiral angle are ground with cup wheels. Grossenhainer Webstuhl und Maschinfabrik, Grossenhain/Saxony.

Metal-Working Machines at the 1932 Leipzig Spring Fair

Shown by Collet & Engelhard, this automatic cutter-head grinder sharpens the face, side and edge of inserted-blade milling cutters, sharpens helical-fluted mills and gear cutters. It can be set for right- or left-hand cutters by a reverse mechanism in the spindle head. Feed of the cutter head is effected per blade and not per revolution of the cutter. This is said to divide wear of the wheel evenly among all blades and to assure concentricity. It is of particular value on tungsten-carbide blades.

Designed for finishing form tools and tungsten-carbide cutting blades, this tool and cutter grinder has hydraulic table traverse, sliding-spindle bearing mounting and forced-feed lubrication. It was shown by Alfred Schütte, Cologne/Rhine.





Aid to Industry by R.F.C. Urged by Secretary Mills

RECONSTRUCTION Finance Corporation loans to privately owned industrial concerns for the replacement and improvement of capital goods were urged upon the Senate by Ogden L. Mills, Secretary of the Treasury, last Saturday. Supported by competent witnesses from business interests, Mr. Mills indicated that such modernization plans would go farther toward creating employment than any other possible action by Congress. At present the Wagner bill proposes an increase in the lending limit of the Reconstruction Finance Corporation by $1,500,000,000 for the purpose of making advances to public and quasi-public enterprises of income-producing character. An obstacle in the Mills program is the motion by Senator Couzens, Michigan, that no part of the increase should be lent to competitive private industry, and the testimony of the witnesses was designed to overcome the senatorial approval of the Couzens motion.

GEORGE H. HOUSTON, president of the Baldwin Locomotive Works and chairman of the Philadelphia committee, representing industry and finance with the Finance Corp., assured the Senate committee that there is no other way to speed up production of capital goods, defining that item as representing facilities and equipment for transportation and machinery for industry. He traced most of existing unemployment to the almost complete cessation in manufacture of capital goods, which is partly caused by inability to obtain long-term credits of suitable character. Replying to an objection of Senator Couzens that further modernization would create an additional surplus of labor, Mr. Houston stated that, "It has been the industrial history of America that as labor was displaced by this technical progress, new industries and new demand sprang up to furnish employment. I am not prepared to believe that this technical progress has stopped."

He was followed by MALCOLM MUIR, president of McGraw-Hill Publishing Co., Inc., publishers of *American Machinist*, who estimated that a selected group of industries surveyed by him could use $1,000,000,000 in capital for replacements, improvements and modernization.

SEWALL AVERY, head of the Gypsum Co. of America, and CLARENCE M. WOOLLY, chairman of the American Radiator Corp., also testified.

S.A.E. Meeting Papers Cover Wide Range of Topics

ENGINEERS and research men on the program of the Summer Meeting, Society of Automotive Engineers, White Sulphur Springs, W. Va., June 12-17, presented many papers of timely value with respect to the numerous manufacturing advances and design improvements that have taken place in the automotive industry in the last year or so. Speaking on the subject "Frame Design and Front-End Stability," CLYDE R. PATON, experimental engineer of the Packard Motor Car Co., traced several years of experiments that finally culminated in the design of a front-end stabilizer, consisting of spring-mounted weights in the ends of the front bumper. Investigation disclosed that the problem of preventing the phenomena of wheel wabble, shimmy and vibratory movements of the radiator, head lamps and fenders involved not only unsprung weight but the structural arrangement of the frame and the body. Chassis-dynamometer tests showed a nodal point of zero torsional vibration at a plane opposite the front seat but varying with body styles, the forward portion of the chassis vibrating torsionally about the longitudinal axis in opposite phase to the rear portion. Experiments proved that damping is needed in the frame and body. Many tests with stiffened frames gave disappointing results on the road as compared with dynamometer tests, and development of flexible engine-mountings complicated the problem. Therefore it became apparent that the frame and body must be treated as a single structure, and a more rigid method of bolting the body to the frame was found to give good results. Diagonal roof bracing and reinforcing the cowl and side panels also increased the body rigidity, decreased the body depreciation and front-end vibration.

Addition of weight at the front, remote from the neutral axis of the frame, was found to have a very beneficial effect, and the stabilizer mentioned was developed.

"Free-Wheeling Devices and Their Control" by AUSTIN M. WOLF, consulting engineer, gave detailed descriptions of such devices and traced the experiences of the Studebaker Corp. in pioneering their development in this country. In this company's first design four rollers of diminishing diameter were used at each lobe of the cam, and after use slippage would occur under the two smallest rollers. A spinning test disclosed that spinning of the rollers and not the torque load was responsible for grooving. The cams were form-ground with the wheel travel parallel to the cam axis which left ridges. Some improvement was obtained from "Cloudburst" treatment. Grinding circumferentially improved the cam surface. Later rollers were centerless ground and lapped. With a polished cam and rollers the life on test was increased 50 times.

Lubrication of the free-wheeling unit was also found to be extremely important. Efforts were made to use the constant-mesh helical gears as a pump. To measure the rear-ward flow from the gears, holes were drilled through the direct-drive clutch member and tests were conducted by driving the pinion in the counter-clockwise direction. This gave an abundance of oil, and it became necessary to make a complete change-over in tooling to manufacture left-hand instead of right-hand helical gears. Abundant lubrication plus the foregoing operations on the cam and rollers produced a unit that showed no wear on the spinning test of 50 hours.

In presenting "Piston Ring Progress," RALPH R. TESTOR and HARRY M. BRAMBERRY, of the Perfect Circle Co., showed that as engine speeds and compression ratios have increased the characteristics of piston rings have had to be developed steadily. Much gaging apparatus for minute dimensions and characteristics of these rings had to be designed. The presence or absence of point pressure—pressure of the ring points against the cylinder wall—determines the efficiency of the ring. To test contact all around the circumference and at the points a radial pressure gage was made. This consists of a steel ring accurately finished internally with 17 rollers located in a retainer. When the piston ring is inserted in the gage the degree of radial pressure is determined by turning each roller between the thumb and finger. Another gage was built to test the radial pressure more quickly, particularly at the points.

According to R. P. RAMSEY, chief engineer, diesel division, Buda Co., a good demand exists for the 500-cu.in. diesel, but a gasoline engine of comparable size can be produced more cheaply at present, mainly because the cost of commercial fuel-injection equipment is out of line with the production cost of a 500-cu.in. diesel. To produce an automotive diesel satisfactory in cost, weight, power output, performance and speed the following qualifications must be met—(a) brake mean effective pressure must be comparable to that of the gasoline engine at comparable combustion pressures, (b) it must idle without dilution, (c) compression should not be so high that the engine is rough and economy is lost at high speeds, (d) ignition noise must be commercially acceptable, (e) the system must be proof

THE BUSINESS WEEK

June 10, 1923

The critical and highly political month of June starts with most business indicators slowly sagging a bit early into the usual slackness of the summer season . . . The only conspicuous exception is the strengthening of building contracts and collateral structural steel awards, supported principally by public building, which apparently has not yet been completely abolished by public opposition and the prevailing economy complex . . . Commodity prices continue to weaken as credit expansion is delayed and the international scramble for gold grows more intense . . . Response of security markets to promises of private banking pool support was sharp but short-lived . . . Congressional uncertainties and anxiety about European developments still overshadow business and financial sentiment, but one by one the alibis are being overtaken by events, and we are being brought face to face with the fundamental issues of recovery which now lie in the field of monetary policy and must be met by international action . . . For these reasons recent gestures toward an international economic conference following Lausanne may finally prove to be the most hopeful development of this period of perplexity and disappointment over the policies so far followed . . . For the moment the most encouraging feature of the immediate situation is the slow strengthening of the banking position, with accumulating evidence that the more destructive aspects of credit deflation are temporarily under control and powerful forces toward expansion are beginning to operate.

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against occasional excessive pressures set up by over-injection of fuel, (f) it must not be sensitive to changes in fuel quality, (g) non-clogging nozzle, and (h) timing must be roughly adjustable. An engine of the 500-cu.in. class is predicted as weighing 12 to 15 lb. per horsepower.

Business Must Absorb Part of Excise Taxes

THE new Federal Revenue Act will add $1,118 millions to the outgo of American taxpayers during the next fiscal year ending June 30, 1933, and a large share of this load cannot be passed along by business. Chief interest centers in the special excises which were inserted in the bill. The increase in the corporation income tax from 12 to 13¾ per cent, with elimination of exemption for small corporations and application of a rate of 14½ per cent on consolidated returns, will add $41 millions to the corporation tax burdens. Other taxes that will rest mainly on business are those on telephone, telegraph, cable and radio messages, on bank checks, and the higher postal rates, all of which together are estimated to mean an increased burden of about $260 millions, mainly borne by business. The stamp taxes on security issues and sales, conveyances, and future sales of commodities amounting to $45 millions might also be added in large part as a contribution to business burdens.

Other excises, amounting to about half a billion, are intended to be borne by consumers, and no doubt some of them will be. But under prevailing market conditions with competition intense during a period of falling prices, a large part of them will probably be absorbed by business.

With business recovery the return from the new taxes may reasonably be expected to rise rapidly to yield a substantial surplus and help reduce the deficit accumulated during the past two fiscal years. This deficit now stands at about $2,700 millions as compared with a billion a year ago.

Automobile Industry Most Reassuring

At the annual presidents' meeting of the National Automobile Chamber of Commerce, during which ALVAN MACAULEY, president of the Packard Motor Car Company, was re-elected president, DR. VIRGIL JORDAN, chief economist of McGraw-Hill Publishing Company, Inc., spoke of the creative initiative of the automobile leaders and said that the industry still remains the strongest and most reassuring part of our business structure. Dr. Jordan said, "The motor car industry has emphasized from the outset the principle that the prosperity of business and of the nation rests upon the purchasing power of the consumer rather than the investing power of the saver, and that the standard of living of the mass of the people is capable of quite indefinite expansion.

He also asserted that the American people, as well as their bankers and business men, had allowed themselves to be stampeded. "In this retreat, like a routed army," he said, "they have abandoned or repudiated most of the economic principles of progress which they had painfully won or toward which they were blindly groping during that much-maligned new era of prosperity preceding 1929. We may have another year or more of difficulty, distress and disorder, domestic and international, but the country will recover from the stupidities of policy that rule us now."

French Market for Anti-Friction Bearings

France, since it is an industrial country, constitutes an important market for any kind of anti-friction bearings. Although most French mechanical industries may be considered prospective purchasers of such bearings the current demand is comparatively inactive. In normal times, however, the United States supplies 4 per cent of the ball bearing imports and 25 per cent of the roller bearing imports.

At the present time participation of American manufacturers in this trade is limited to certain kinds of bearings. The first class consists of roller bearings which do not appear to be made in France, and which due to efficient and superior design are able to successfully compete in that market with bearings produced in other parts of Europe. French statistics indicate that about 8 metric tons of American-made ball bearings and about 38 metric tons of American-made roller bearings were imported into France in 1930. It is believed that approximately 20 per cent of these consisted of the first class referred to above, while indications are that the remainder of this class of imports consisted of bearings of various sorts assembled, or destined to be assembled, in bearing units designed to meet the special needs of concerns in France handling American automotive equipment. In addition to the above types of American bearings, the manufacture of tapered bearings of special types, made in conformity with American designs and more or less in accordance with American manufacturing methods, has been undertaken in France by a well established French concern.

The percentages of ball-bearing imports of 188 metric tons by countries of origin were as follows: Italy, 35 per cent; Sweden, 32 per cent; Great Britain, 11 per cent; Germany, 10 per cent; United States, 4 per cent, and miscellaneous sources, 8 per cent. Corresponding figures covering a total of about 152 metric tons of roller bearings are as follows: Germany, 31 per cent; United States, 25 per cent; Sweden, 18 per cent; Great Britain, 10 per cent; and other countries, 16 per cent.

"Shot Welding" Revealed At Buffalo A. S. M. E. Meeting

AMONG the papers presented at the Buffalo Meeting of The American Society of Mechanical Engineers, June 6, was "Stainless Steel in Aircraft Construction," by COLONEL E. J. W. RAGSDALE, research engineer of the Edward G. Budd Manufacturing Company. This paper gave the first comprehensive explanation of the "shot welding" process, now famous for its part in the construction of the Budd-Michelin railway car, which was largely built up from stainless steel. An abstract of the paper follows, giving a description of the process, its advantages for stainless steel construction and the cost data.

It is well known that 18-8 achieves its stainless properties from heat-treatment, and that any subsequent heating affects its stainless qualities. Such heating occurs in welding, and a method was sought whereby change in the corrosion-resistant properties of the metal could be eliminated and the strength of the metal retained. In spot welding the welded spot has heretofore been usually surrounded by an annular ring of precipitated carbides, but these cannot be positively detected without the aid of a microscope after sectionalizing and etching with hydrofluoric acid. This ring has been termed the "corona." Its extent is known to be a function of time and current; its existence cannot be recognized by the eye.

Appreciation of these conditions led the Edward G. Budd Manufacturing Company to develop a spot welding machine, the features of which are: absolute uniformity of current supply, use of high currents in a very brief, controllable time element and a recorder which supplies visible and audible record of performance. With the use of the shot welder, corona-free welds can be consistently made, which automatically opens up a large structural field to stainless steel.

In shot or spot welding, the diameter of the fused slug should have some reasonable relation to the thickness of the sheets to be joined. No closed section can economically suffer large welding flanges, for it is here that compression failure initiates. Shot welding encourages use of a narrow flange —much narrower than would obtain in a riveted connection—and, in consequence, a spot not greater in diameter than three times the double thickness of material should be used. The flange, in turn, should be at least three spot diameters in width. There is no need for large areas of fusion, since good welds will show twice the shear of a rivet of like diameter and can be spaced fifty per cent closer together. Shear is not the only test for welds; they must be tough enough to permit rotation through at least 60 deg.

Pressure on electrodal points must be sufficient to bring the flanges closely together. Otherwise, the current diffuses over a circuitous path and the amperage is reduced. The weld recorder signals such an event.

An outstanding essential of a shot-welder designed for aircraft or other structural use is portability. In the Budd machine, long lines of cables attach to hand or air tongs, and these are dragged into almost inaccessible places. The machine can be rolled about the floor or lifted by cranes. Current loss in cables and tongs is substantial and must be compensated for. Test welds must be made under each and every condition of use.

The current and dwell are established by the machine. The inspector usually makes the settings for test welds and then adjusts the recorder to the new value. Any variance of conditions which may make for over or insufficient current-time relation causes a bell to ring continuously until the machine is reset. Every weld made or failed is recorded on a tape, the length of line being a function of the $I^2R \cdot t$, in which I represents amperes; R, resistance and t, time of dwell. This is the total heating value of the electric energy supplied. The heat which goes into a single shot-weld in two pieces of .012-in. material is but 0.035 B.T.U. This also explains how assemblies can be made without distortion.

While normal practice is to use two electrodes (one directly opposite the other, and both of similar shape) unusual conditions often dictate welding by indirection. One electrode may consist of a pad clamped to a sheet while the other is conventionally pointed and held against the member to be welded to that sheet. Again, both electrodes may be pointed and held against the member some distance apart, while a copper plate rests beneath the sheet. Here, two welds are made simultaneously, the current passing from one point through member and sheet into the copper plate, then along the copper plate until it comes opposite to the point where it exists through sheet and member.

Both methods find application in shot-welding a corrugated member to a flat sheet such as is used in flooring or partitions. The sheet rests on a large copper plate and the only care is that electrodes are held far enough apart to insure sufficient resistance in the steel pieces.

Any of the many forms of indirect welding are apt to be more uncertain than in conventional practice. Both care and control must be exercised throughout the operation. Even then, good design will obviate the condition where the structure is important.

Welding through several thicknesses is possible, and frequently done; nor do the pieces have to be of equal gage. The diameter of the spot is determined largely by current and time rather than by the size of the electrodes. Naturally, however, the spot cannot exceed in area that of the point. So far, Elkonite has proven to be the most satisfactory tip material.

Shot welding makes the use of stainless attractive in experimental work. For small structures, the only jig required consists of a number of wooden blocks nailed over the blueprint. For more elaborate ones, a wooden frame is erected and significant points are notched out. The component strips which go to make up a closed section are, in themselves, flexible and can be naturally bent to even sharp curvature. They are then welded together and attain the rigidity peculiar to a closed member.

Shot welding, is, moreover, the quickest and cheapest form of attachment. One operator can average 10 welds a minute on complicated work and forty on fairly straight seams. Machine welding has no apparent limit. Using only one pair of points, 100 welds per minute have been consistently made.

Industrial Machinery Exports Show Little Change

INDUSTRIAL machinery exports from the United States during April amounted to about $4,900,000, representing a slight decline in comparison with similar shipments in the previous months, but a considerable drop in contrast to the total of $12,000,000 established in April, 1931, according to the Industrial Machinery Division, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce. The only individual item which passed the $1,000,000 mark in foreign sales volume during the period under review was the classification comprising power-driven and other metal-working machinery, exports of which totalled $1,315,000, a gain of approximately 25 per cent over the same business in March.

The returns dealing with the remaining classification covered by this survey indicate that trade in the various lines was held at a fairly even level with the business of the previous month. In fact, the most noteworthy feature of the

Exports of Industrial Machinery from the United States

Class of Machinery	1931, April	1932 March	1932 April
Power generating, except electric and automotive:			
Steam engines (1)	$222,553	$120,920	$86,142
Internal combustion engines (2)	529,291	209,875	242,085
Water wheels and water turbines	119,665	21,547	1,915
Total	$871,509	$352,342	$330,142
Construction and conveying machinery	1,104,668	477,577	233,056
Mining, oil well and pumping machinery:			
Mining and quarrying	849,056	436,815	288,986
Well and refinery	1,081,874	331,798	397,008
Pumping, power (3)	353,385	171,910	153,013
Total	$2,284,315	$940,523	$839,007
Metal working machinery:			
Power driven	2,462,921	838,606	1,118,110
Other	343,720	215,313	197,692
Total	$2,806,641	$1,053,919	$1,315,802
Textile, sewing and shoe machinery:			
Textile	594,350	484,093	365,363
Sewing, industrial	215,747	74,400	199,059
Shoe	105,119	47,000	59,387
Total	$915,216	$605,493	$623,809
Other industrial machinery	4,106,359	1,697,473	1,527,034
Grand total	$12,088,908	$5,127,327	$4,868,850

(1) Excludes locomotives and parts.
(2) Excludes engines not over 10 horsepower.
(3) Excludes windmill pumps.

period was the continued absence of important developments in connection with shipments of this nature, the month-to-month totals of which have remained at approximately $5,000,000.

The table produced above shows the value of the various classes of industrial machinery exports in April, 1932, as compared with April, 1931, and March, 1932.

Machinery Dealers See Big Replacement Market

THE Spring Meeting of the Associated Machine Tool Dealers held at Granville Inn, Granville, Ohio, June 6-7, brought together a very representative group of executives from companies covering the Eastern and Midwest sections of the country, engaged in machine tool selling.

The tone of the convention was quickly developed by the study of "Underlying Conditions," a subject suggested by WILLIAM K. STAMETS, president. Papers were read covering each district represented in an effort to show the basic soundness of industry in the different sections of the United States and the probable scale of future operations, thus indicating whether or not machine tools will be required in a volume comparable to other normal years.

The survey made by the dealers who prepared the papers indicated that manufacturers realized the absolute necessity of modernizing their plants if they are to compete in future markets, by replacing obsolete and worn out equipment. The amount of this replaceable equipment is so large that it should keep equipment factories busy for years to come.

The following dealers contributed papers on the above subject: GEORGE CHERRINGTON, Brown & Zortman Machinery Co., Pittsburgh, Pa.; F. W. SCHIEFER, Crane, Schiefer, Owens, Inc., Syracuse, N. Y.; GEORGE E. YOUNG, C. H. Gosiger Machinery Co., Dayton, Ohio; W. J. RADCLIFFE, E. A. Kinsey Co., Cincinnati, Ohio; J. ROY PORTER, Marshall Huschart Machinery Co., Chicago, Ill.; OMAR S. HUNT, Marshall Huschart Machinery Co., Indianapolis, Ind.; W. F. MCCARTHY, Henry Prentiss & Co., New York; E. F. SANDS, JR., Robinson, Cary & Sands Co., St. Paul, Minn.; TYLER CARLISLE, Strong, Carlisle & Hammond Co., Cleveland, O.; O. R. RABEL, E. F. DAWSON, Star Machinery Co., Seattle, Wash.; JOHN SAUER, JR., Peninsular Machinery Co., Detroit, Mich.

The meeting was addressed by ROBERT GAYLORD, president of the National Machine Tool Builders' Association, and his subject "The Machine Tool Industry" was well received. MASON BRITTON, vice-president of McGraw-Hill Publishing Co., Inc., publishers of *American Machinist*, was present and talked briefly on general business conditions.

Education Society Joins Council

Arrangements have been completed whereby the Society for the Promotion of Engineering Education will become a member organization of the American Engineering Council. This is an important step in the development of the organization of the engineering profession, because the Society for the Promotion of Engineering Education is the foremost exponent of engineering education in the United States. It is composed of 2,274 members, largely teachers and professors in engineering colleges. Many problems of concern to the engineering profession, which are acted upon by the American Engineering Council, involve the future of engineering education.

Railroads Want R.F.C. To Loan for Bonds

A plan to bring the Reconstruction Finance Corporation to the rescue of railroads, when aid now available threatens to fall short of averting receiverships, is being considered by railroad executives. It is proposed that the R.F.C. make loans to enable roads to buy in their own bonds at a price suggested by the I.C.C. when speculation interferes with refinancing or when a road does not have collateral for a loan for other purposes.

In both operations the bonds would be accepted by the R.F.C. as collateral at some higher figure commensurate with similar issues in its loan portfolio on the condition that when the loans are paid the bonds will be cancelled. Thus capitalization and interest charges would be reduced. Several roads now are buying their bonds on the market. The majority cannot do so without help.

American Authors on Amsterdam Program

Twelve questions attacking many of the everyday problems in industry will be discussed at the Fifth International Congress for Scientific Management, to be held in Amsterdam, July 18-23. Exponents of scientific management from eighteen centuries will gather to exchange ideas on the relation of its principles to such subjects as budgets and cost methods, the selection, training,

promotion, and remuneration of personnel, and production and marketing. This congress is held under the jurisdiction of the International Committee on Management.

Among papers submitted from the United States are: "Uniform Cost Accounting," G. A. WARE, assistant secretary, News Print Service Bureau, New York; "The Training of Foremen in Modern Management Methods," EDWARD S. COWDRICK, New York; "The Essentials of a Rational System of Promotions," ELLIOTT DUNLAP SMITH, director of industrial relations, Yale University; "Relative Advantages of Different Methods to be Used to Interest Workers in Increasing Their Efficiency," A. H. YOUNG, secretary, Industrial Relations Counselors, New York; and "How Should Scientific Management Be Applied to Industries with Mass Production of a Single Article—To Industries with Standardized Mass Production in a Few Lines—To Industries Without Standardized Mass Production—To Industries Where Every Article Is Made to Order," RAYMOND S. PERRY, vice-president, The Ingersoll Milling Machine Company.

Study of Metal Wear by A.S.M.E. Proposed

The main research committee of the American Society of Mechanical Engineers is now considering the desirability of organizing a special research committee to stimulate further research in the problem of wear-resistance of metals and to act as a clearing house for the results. A large amount of independent work has already come to light, and indicates the possibility of arriving at accurate and comprehensive conclusions of the correlation of results of all such investigations. Important papers of recent origin are "Relative Wear of Metals Due to Abrasion," by C. R. WEISS, Link-Belt Co., and "Wear of Metals," by LEWIS JORDAN, Bureau of Standards.

Kinematics Course at Brooklyn Polytechnic

A post-graduate course in theoretical and applied kinematics will be offered during the coming year by the Brooklyn Polytechnic Institute, Brooklyn, N. Y. Besides new and simple methods for the analysis of motions, it will present a complete systematic classification of machine elements, kinematic chains, mechanisms and machines, and a general method of making a kinematic analysis of machines leading to the kinematic synthesis of machines to be designed. These methods will provide designers of complicated machinery with scientific tools for securing the desired results quickly and directly.

• BUSINESS ITEMS •

Inland Steel Co., Chicago, announces the opening of offices at 1118-19 Fisher Bldg., Detroit and the appointment of J. H. FITCH, JR., as district sales manager. This marks Inland's first entry into the Detroit area during the last ten years and is directly related to the recent installation and completion of a large continuous strip sheet mill, which produces auto body sheets and various other strip and sheet products used in the automotive industry. Mr. Fitch served as treasurer, vice-president and director of the Newton Steel Co. until his resignation on April 1.

Receivers were appointed in common pleas court, Cincinnati, for the Newman Manufacturing Co., manufacturer of ornamental and architectural bronze, brass, aluminum, nickel and iron work. The action was brought by SIDNEY J. NEWMAN, president. ROBERT E. MULLANE and WILLIAM H. MITCHELL were appointed receivers. The assets according to the last statement, that of December 31, 1930, were $2,105,494.

A receivership suit has been filed in chancery court against the White Sewing Machine Corp., Cleveland. According to the bill, the corporation has a contract expiring in 1935 under which it supplies all the sewing machine requirements of Sears, Roebuck & Co. The bill states further that for the quarter ended March 31 the corporation had a net loss of $455,996.

United States Steel Corp. has recently negotiated a contract with the Edward G. Budd Manufacturing Co., through which it has acquired the rights to the Budd system of stainless steel construction, including its "shot welding processes," for the use of its subsidiaries in the construction of ships, bridges and structural elements in buildings.

The Pratt & Whitney Aircraft Co., East Hartford, Conn., is producing its new two-row radial air cooled motors exclusively for the Navy Department. This production will continue through the rest of the year. Next year, if possible, similar motors will be manufactured for commercial use. The engine has 14 cylinders in two rows of seven each and develops 700 hp.

Interstate Airways, Inc., Hartford, Conn., has incorporated under Connecticut laws to manufacture airplanes and deal in same with offices at Brainard Field. The incorporators are F. P. and MARY L. SANSOM and A. F. TENNANT, all of Hartford.

Landers Frary & Clark, New Britain, Conn., manufacturers of electrical appliances and cutlery, has engineering work under way for the purpose of manufacturing an electric refrigerator. Market possibilities are being surveyed.

The Allen-Bradley Co. has announced appointments as follows: WALTER A. BLACK, formerly chief engineer of the Indianapolis works of Fairbanks-Morse & Co., will be district manager for Cleveland, with offices at 942 Prospect Ave. JOHN B. VOGEL, formerly sales engineer for the Westinghouse Electric Supply Co., will be district manager at Grand Rapids, with offices at 41 Grandville Ave.. S.W.

Announcement is made by C. H. HOBBS, president of the Detroit Seamless Steel Tubes Co., that the following concerns have recently been added to the list of mill supply distributors for the Detrolined bushing stock manufactured by his company: Topping Brothers, New York City; Lewis E. Tracy Co., Boston; Charles C. Lewis Co., Springfield, Mass.; and The E. C. Church Co., Providence, R. I.

The Kingsbury Machine Tool Corp. has arranged with Stedfast & Roulston, Inc., Boston, to represent it for its production drilling and tapping equipment in New England with the exception of Connecticut.

The Poole Foundry & Machine Co., Baltimore, Md., has announced the appointment of the Ladd Equipment Co., First National Bank Bldg., Pittsburgh, Pa., as its sales representatives for the Poole all-metal flexible couplings in the Pittsburgh, Mahoning Valley and West Virginia district.

The general offices of the T. H. Edelblute Co., formerly at Oliver Building, Pittsburgh, Pa., has been consolidated with the works at Reynolds, Pa. The new address is P. O. Box No. 1, Reynoldsville, Pa.

The Magnetic Mfg. Co., Milwaukee, has appointed J. E. HARLOW as Cincinnati representative, with offices at 7 West 6th St. He will give engineering service on the complete line.

The Augustine Foundry Ltd., Kitchener, Ont., has been purchased by the Imperial Iron & Radiation Corp., St. Catherines, and will be moved to the latter place soon. JOHN BIBBY, superintendent of the Augustine concern, will go to St. Catherines as general superintendent.

The Johnson Machine Works, Charlton, Ia., owned and operated by RUSSELL JOHNSON, is to undergo considerable improvement during the summer months. A new addition is to be erected to house a new 3-ton crane, a hydraulic planer, punch, electric welder, press and other equipment.

Link-Belt Ltd., has announced the removal of its Montreal office and warehouse to 934 Inspector St. to give better service and afford enlarged facilities.

The American Car & Foundry Motors Co. will transfer the bus manufacturing activities from Detroit to the Philadelphia plant of the J. G. Brill Co., to effect economies.

Locomotive and car shops of the Chicago & Northwestern at Chicago were closed last week for an indefinite period.

Nominations for A.S.T.M. Officers

Announcement has been made of the nomination of officers of the American Society for Testing Materials for the ensuing year. Election is scheduled for the annual meeting of the Society, June 20, in Atlantic City. CLOYD M. CHAPMAN, consulting engineer, New York, has been nominated for the office of president. Mr. Chapman is a member of several societies and is chairman of the Standards Council of the American Standards Association. He is a member of several A.S.T.M. committees and was a member of the executive committee for 1926-28. WILLIAM H. BASSETT, metallurgical manager, the American Brass Co., was nominated for vice-president. Members nominated to the executive committee are as follows: H. A. GARDNER, chemical engineer, the Institute of Paint & Varnish Research, Washington; J. O. LEECH, assistant metallurgical engineer, Carnegie Steel Co.; J. T. MACKENZIE, chief chemist, American Cast Iron Pipe Co.; J. C. RAMAGE, engineer of tests, Southern Railway System and H. S. VASSAR, laboratory engineer, Public Service Electric & Gas Co.

Service Officers Win Welding Prizes

First and second prizes in the Second Lincoln Arc Welding Prize Competition, sponsored by the Lincoln Electric Co., Cleveland, Ohio, went to officers in the United States Army and Navy. First prize was awarded by the jury, under the direction of PROF. E. E. DREESE of Ohio State University, to Lt. Com. HOMER N. WALLIN, U.S.N., and Lt. HENRY A. SCHADE, U.S.N., working in collaboration on the paper, "The Design and Construction of an Arc Welded Naval Auxiliary Vessel." The second prize was won by MAJOR G. M. BARNES, U.S.A. Approximately 400 papers were submitted.

• PERSONALS •

EDWARD T. ASHWORTH, Bethlehem Shipbuilding Corp., Quincy, Mass., was elected recently as chairman of the Boston chapter, American Society for Steel Treating.

D. S. HARDER, works manager of the Edward G. Budd Company's Detroit plant, has been made works manager of the Philadelphia plant as well, and has gone to that city. LEROY A. COLEMAN is production supervisor at Detroit.

ARTHUR JACKSON, president of the Arthur Jackson Machine Tool Co., Toronto and Montreal, will sail July 15, accompanied by Mrs. Jackson, to visit the machine-tool centers of Great Britain, Germany, France, Czechoslovakia and Switzerland, where he will study the latest machine-tool developments.

PAUL W. LITCHFIELD, president of the Goodyear-Zeppelin Corp., was presented with the Spirit of St. Louis Medal, awarded for meritorious service in the advancement of aircraft design and construction in America, at a dinner closing the annual meeting of the aeronautic division of the American Society of Mechanical Engineers, Buffalo, June 7. Mr. Litchfield received the medal in consideration of his part in the construction of the air liner *Akron*.

WILLIAM E. ODOM, for the past eight years director of industrial relations of the National Metal Trades Association, has resigned that position effective July 1, to become vice-president of Industrial Relations, Inc., and a member of the editorial staff of *Industrial Relations* magazine. His work will be an extension of the line of activity on which he was recently engaged.

HARRY G. PORCH, New England manager for Lukens Steel Co., 131 State St., Boston, has also been placed in charge of local headquarters of Lukenweld, Inc., at the same address. H. G. AUSTIN will be Mr. Porch's assistant for Lukenweld.

• OBITUARIES •

JOHN M. BROWN, president of the Brown-Boggs Foundry & Machine Co., Ltd., Hamilton, Ont., died June 3. He was 76 years of age.

A. L. CROMLISH, general superintendent of the Duquesne works of the Carnegie Steel Co., died June 9. He was 57. In 1920 he became general superintendent of the Farrell works, and assumed the last connection in 1931.

OSCAR K. DAVIS, 66, secretary since 1917 of the National Foreign Trade Council, New York, died June 3.

WILLIAM FOXALL, 67, formerly president of the Wilkes Rolling Mill Co., Sharon, Pa., died May 23 in Honolulu, Hawaii. In 1907 he was elected president of the Wilkes Company, and resigned several years ago because of ill health.

ARNOLD J. HOLZER, 49, vice-president of the Holzer Sheet Metal Works and Orleans Steel Products Co., New Orleans, died recently.

ROBERT M. KEENEY, 48, president of the Pittsburgh Crucible Steel Co., died June 5. He had served a half-dozen major steel companies before assuming the presidency of Pittsburgh Crucible and vice-presidency of the Crucible Steel Co. of America.

ROBERT D. MAHAFFEY, vice-president and treasurer of the American Well Works, Aurora, Ill., manufacturer of centrifugal pumps, died June 3. He was 65 years of age. He was a past president of the Hydraulic Society of America and had been associated with American Well Works for 43 years.

JAMES A. MCDONALD, 59, assistant to the president, Standard Sanitary & Mfg. Co., Pittsburgh, Pa., died June 4. Mr. McDonald had been with the company for more than 40 years.

ALBERT B. SHULTZ, former president of the Houde Shock Absorber Co., Buffalo, who retired in 1928, died June 3.

WILLIAM G. THUM, 72, president of the Murrill & Keizer Employee Co., machinists, Baltimore, died June 8. He was formerly employed by the firm as a draftsman and was made president when the officers of the company turned the business over to the employees.

HARRY B. USHER, 71, president of the Smith-Booth-Usher Co., Los Angeles, Calif., died June 7. He was a native of Seneca Falls, N. Y., and for many years was secretary and general manager of Goulds Pumps, Inc., in that city. He had resided on the Pacific coast since 1904.

• MEETINGS •

AMERICAN SOCIETY OF MECHANICAL ENG'RS
Second National Applied Mechanics Meeting, Yale University, New Haven, Conn., June 23-24-25.
Semi-Annual Meeting, Bigwin, Canada, June 27-30.
National Machine Shop Practice Meeting, Buffalo. Week of Oct. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York, N. Y.

AMERICAN INSTITUTE OF ELECTRICAL ENG'RS
Summer Convention, Cleveland, O. June 20-24. H. H. Henline, Assistant National Secretary, 33 W. 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS
Annual meeting, Atlantic City, June 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

NATIONAL METAL CONGRESS & EXPOSITION
174th Regiment Armory, Buffalo, N. Y., Oct. 3-7. Sponsored by A.S.S.T., with cooperation of A.S.M.E., Institute of Metals and Iron & Steel Divisions of A.I.M.E., A.W.S., and the Wire Association. W. H. Eiseman, 7016 Euclid Ave., Cleveland, Director.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

California—Shell Oil Co. of California, Shell Bldg., San Francisco, having plans prepared for 10 or more super service stations, various locations in San Francisco and Oakland. $15,000 each. Engineering Dept. of owners in charge.

Calif., San Francisco—Goodyear Tire & Rubber Co., 6701 South Central Ave., Los Angeles, awarded contract for the construction of 2 story, service warehouse and shop, 11th and Mission Sts. Estimated cost $40,935. Noted May 19.

Indiana—State Hy. Comn., Indianapolis, having plans prepared for state garages, at Bloomington, Aurora and Ridgeville. Total estimated cost $45,000. J. J. Brown is direceor of highways.

Ind., Evansville—Gaseteria, Inc., awarded contract super service station, Goodsell and Riverside Sts. Estimated cost $40,000. Private plans.

Ind., Fort Wayne—P. Eckrich & Sons, Kalamazoo, Mich., plans the construction of a 150 x 200 ft. factory. Estimated cost $50,000. Owner will build by separate contracts. L. A. Kingscott, 204 Elm St., Kalamazoo, Archt. and Engr. will supervise letting of contracts and construction. Noted Mar. 10.

Ind., Indianapolis—Lubrite Refining Co., awarded general contract for constructing a super service station at Meridan and Walnut Sts. Estimated cost $40,000.

Ia., Postville—Midwest Lumber Co., 7th and Jackson St., Dubuque, plans rebuilding lumber, storage, distributing plant, to replace fire loss. Estimated cost $40,000. Maturity indefinite.

La., Monroe — FACTORY — Dixie Bedding & Furniture Co., Monroe, plans repairing factory and storage building, to replace fire loss. Estimated cost $40,000.

N. J., Hoboken—R. B. Davis Co., 38 Jackson St., awarded contract for construction of a 1 story, corrugated paper manufacturing plant, Ferry and Marshall Sts. Automatic Paper Machinery Co., 311 Pine St., Elizabeth, lessee. Noted June 9.

N. J., Keyport—Clifford Lumber Co., plans rebuilding lumber plant. Estimated cost $40,000. Maturity indefinite.

N. J., Montclair—Owner c/o A. E. Ramhurst, Archt., 516 Bloomfield Ave., preliminary plans completed for construction of a 2 story, garage and salesroom. Estimate cost $100,000.

N. J., North Bergen—J. Bock, c/c McDermott & Binda, Archts., 582 Bergenline Ave., Jersey City, plans construction of 1 story shop building, Van Wagenen St., and Bergen Turnpike. Estimate cost $40,000. Will build by separate contracts. Noted May 19.

N. J., Rutherford—Owner, c/o H. C. Hammel, Archt., 130 Branford Pl., Newark, having plans prepared for construction of 2 story, garage, super service station, repair and painting building. Estimate cost $150,000.

N. Y., Binghamton—Marshall-Nash Motor Co., 36 Collier St., preparing plans for rebuilding garage, showroom, and repair shop Collier St. Estimated cost $40,000. Maturity indefinite.

N. Y., Brooklyn—E. Bender, c/o P. Goldstein, East New York and St. Marks Ave. plans construction of a shop building East New York and St. Marks Aves. Will build by separate contracts and day labor.

N. Y., Brooklyn—Harvey Development Corp., L. Silverman, Pres., 2075 86th St., takes bids late in November for construction of shop, service station and garage, Coney Island Ave. and Avenue L. A. Goldberg, 164 Montague St., is architect. Noted May 26.

N. Y., Brooklyn—M. Levy, 238 Pennsylvania Ave., awarded contract for construction of 1 story, basement, shop and brake service station, Pitkin and Pennsylvania Aves.

N. Y., Brooklyn—H. J. Nurick, Archt., 830 Pitman St., will take bids about November 1, for construction of a shop, Jamaica and Force Tube Ave. for F. Levyne, 58 Etna St. Noted May 26.

N. Y., Brooklyn—Rugby Co., c/o E. Greenberg, 914 45th St., plans construction of 100 x 100 ft. service garage, 59th St. and 23rd Ave. Work will be done by separate contracts. M. N. Weinstein, 93 Court St., is architect. Noted May 26.

N. Y., Brooklyn—Southern Lumber Co., P. Applebaum, 771 Atlantic Ave., awarded contract for construction of 3 story, shop addition, Waverly Ave. I. Primost, 214 Throop Ave., is architect and engineer. Noted May 26.

N. Y., Brooklyn—Sarit Traders, Inc., 271 Madison Ave., New York, plan construction of a 40 x 137 ft. shop and auto laundry at Kings Highway and East 91st St. Owner will build by separate contracts and day labor. Maturity in the fall. T. Goldstone, 191 Joralemon St., is architect.

N. Y., Clyde—Wood Milling Co., Clyde, plans rebuilding plant to replace fire loss, Fort St. Estimated cost $40,000.

N. Y., Corona—E. Baylies, c/o J. Baker, archt., 1009 Jackson Ave., takes bids about September 1 for construction of 21 x 183 ft. garage, repair shop, auto display rooms, Northern Blvd. and 117th St. Estimated cost $100,000. J. Baker, 1009 Jackson Ave., Long Island City is architect. Noted May 26.

N. Y., Corona—F. Carlozzi, 148-63 42d Ave., plans 4 buildings, 16 x 20 ft. 28 x 45 ft., 40 x 60 ft. and 13 x 17 ft., repair shop and garage, Roosevelt Ave. and 117th St. Owner will build by separate contracts. Noted May 26.

N. Y., Long Island City—Charrin Realty Corp., 163-18 Jamaica Ave., Jamaica, will build 100 x 194 ft. service garage, 44th St. and 25th Ave. Work will be done by separate contracts. Estimated cost $60,000. Bids will be taken in fall. Murray & Klein, 64 Court St., Brooklyn, are architects. Noted June 2.

N. Y., Long Isand City—Land Grove Realty Corp., 270 Bway., New York, 25 x 65 ft. garage, greasing, gas station, service station, Roosevelt Ave. and 69th Sts. Owner will build by separate contracts. W. V. McDevit, 185 Forest Ave., St. George, is architect.

N. Y., New York — J. F. McCarroll, 15 Indian Lake Dr., having plans prepared for construction of a 1 story, 35 x 42 ft. service station and repair shop, Tremont and Dewey Aves. Private plans.

N. Y., New York—Corporation c/o D. Betinger, 563 East Tremont Ave., having preliminary plans prepared for construction of a 1 story, 25 x 45 ft. service station and auto repair shpo. H. Nordheim, 565 E. Tremont Ave. is architect.

N. Y., Woodhaven—Krausahr & Oldus, 16 Court St., Brooklyn, having plans prepared for the construction of a 1 story, 53 x 108 ft. service garage at Metropolitan Ave. and 126th St. Lama & Proskauer, 383 Jay St., Brooklyn, Architects. Noted under Woodlawn June 9.

N. C., Charlotte—Reading Battery Co., Reading, Pa., having plans prepared for warehouse and assembly shop for manufacturing batteries, here. J. T. Moore, Reading, Pa., Genl. Mgr.

N. C., High Point—Carolina Container Corp., Prospect Rd., plans construction of a 1 story plant addition. Estimated cost about $40,000 including equipment.

N. C., Thomasville—North State Veneer Co., plans rebuilding veneer plant destroyed by fire. Estimated cost $45,000 or more.

O., Cincinnati—Bd. Educ. Will receive bids until June 27 for school including shop facilities, manual training equipment, etc., on Cambridge, Mears and Beacon Sts. Estimated cost $175,000. Kruckemeyer and Strong, 405 St. Paul Bldg., are architects.

O., Cincinnati — Metal Specialty Co., 1533 Riverside Dr., soon lets contract for constructing factory, Lagdon Farm. $200,000. Tieg & Tee, 34 West 6th St., are architects.

Pa., Butler—Brier Hill Coal Co., Charles H. Gould, Genl. Mgr., Butler Natl. Bank, having plans prepared for mine tipple and equipment including 400 ft. 30 in. belt conveyor feeder, vibrator, lowering equipment, crusher and auxiliary screens. Owner will build with own forces and will soon ask for bids on equipment. A. M. Klink, Butler, is engineer.

Pa., Phila.—J. G. Brill Co., 62nd St. and Woodland Aves. plans alterations to automotive manufacturing plant and installation of equipment incident to combining the motors division of American Car & Foundry Co. at Detroit with Brill plant here. $40,000.

R. I., Providence—Phillips-Baker Rubber Co., 44 Warren St., awarded contract for construction of a 2 story, 40 x 115 ft. plant addition at Westfield St.

Pa., Scranton — Standard Oil Co., Public Ledger Bldg., Phila., 2 story, 40 x 108 ft. warehouse; 3 story 65 x 125 ft. office and garage, and 135,000 gal. storage tanks, Amelia Ave. and Race St. Estimated cost $250,000. Owner builds.

Va., Norfolk—White Lumber Co., Church St. and railroad tracks, plans rebuilding manufacturing plant. Maturity indefinite. Estimated cost $60,000.

N. S., Espen—A. J. Croft, having plans prepared for construction of shingle mill including equipment. $10,000.

Ont., Copper Cliff—Canadian Industries Ltd., 1050 Beaver Hall Hill, Montreal, Que., having plans prepared for construction of plant to recover sodium and aluminum sulphate from the mining slag. Estimated cost $50,000.

Ont., Midland—Letherby, Terry & Nicholson, Midland, plans lumber, storage and distribution plant. Cost to exceed $50,000.

Ont., Niagara Falls—Niagara Searchlight Co., 800 Ferry St., Niagara Falls, N. Y., plans construction of a 1 story branch plant. Estimated cost $40,000.

Que., Hull—The E. P. Eddy Co., Ltd., Bridge St., M. Pratt, engr. will receive bids about July 15 for construction of a new paper mill and office. Estimated cost $400,000.

Union Soviet Socialist Republics—Soviet Government c/o Amtorg Trading Corp., 261 5th Ave., New York, engaged Multibestos Co., Walpole, Mass. to supervise construction under technical aid contracts of asbestos manufacturing and brake lining plant at Yaroslovl:—Sieberling Rubber Co., Carter Ave., Akron, O., supervise under technical aid contracts, cord mill, rubber reclaiming plants and rubber foot wear factories, Yaroslovl:—plans industrial development of manganese deposits and constructing branch railroad, Achinks, Western Siberia.

Equipment Wanted

D. C., Wash.—June 23, by Quartermaster, Marine Corps., 1 tenoner machine, 1 scroll saw machine. Schedule 961.

N. H., Portsmouth—June 21, by Bureau Supplies and Accounts, Navy Dpt., Wash., D. C. 1 motor driven screw cutting lathe, and spares; Schedule 8193.

Mo., Eldon—W. A. Fredericks, Eldon—electric welding machine, gas motored powered.